SEPTEMBER, 1912



# The Yale Scientific Monthly

VOL. XIX No. 1

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. SEPTEMBER, 1912. NO. 1

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. SEPTEMBER, 1912. NO. 1

## EDITOR'S NOTES.

### TO 1915 S

EVERY year Sheff renews its youth. This spring-time of the college comes in September instead of April, but it is spring nevertheless. Here are several hundred young men entering our gates bringing us new life and blood to carry on the work of Yale. What possibilities are opened up with every new Freshman Class! Future 'varsity captains, future scholars and scientists are all lurking in that heterogeneous crowd marching to their first "rush". Yale has much to offer them, but they in turn will give much to Yale.

Sometimes it seems as if the incoming class were given so much advice about college life and customs that they were left no time to consider more important matters. When you decided to come to Yale you were deciding on something more than a three years' residence with congenial classmates. You chose to become a member of a great university and to link yourself with the traditions of a great past as well as assuming an obligation toward the future. Something of what Yale has meant, you know already. Something of what Yale is to be will depend

upon you. This is the obligation you have assumed in coming here, and it is this fact which I wish you to keep in mind.

Over all the advice to know your class,—to "go out for something,"—(all of it excellent advice and worth following), is the larger ideal of Yale itself. Make the teams, "heel" the papers, and follow the other activities according to your ability, but do not forget that all this does not make up the sum of Yale. You must do more. You must ask yourself, "How shall I as a citizen of this country justify the three years I am to spend at Yale?" Your responsibility is increased by the opportunity which has been given you. A great university is the center from which spread out across the land waves of power. These waves are weak or strong according to the men who make them. You have now become a part of this center of power. If you think of your college career in this way, you will have no difficulty, when Senior year comes, in answering the question which I have bid you ask yourself.

This plea does not mean that you are to do nothing else but "grind." It is a plea for you to acquire at the outset a true sense of proportion and an idea of the real values in college life. Do not drift through your college course following only the lines of least resistance. Use all sides of the opportunities offered you and try to take the best from each. Make symmetry and not lop-sidedness your ideal. And so, gentlemen of the Freshman Class, welcome to Yale!

J. R. CRAWFORD.

* * *

## THE SHEFF HONOR SYSTEM—ITS HISTORY AND ITS MEANING TO FRESHMEN

THE Honor System which was adopted in Sheff last year at the instigation of the Student Council and by the vote of the undergraduates marked a critical period in the history and future of Sheff. Similar to revolutions for better forms of government in the history of a nation, there was a revolution in Sheff against the dishonesty and general attitude in examinations of a

great many undergraduates. Among the students who were honest and who had the welfare of Sheff most at heart there had been a constantly increasing feeling of dissatisfaction and rebellion against the wholesale cribbing in examinations, and finally, this long, pent-up feeling burst forth in a general uprising of the better element in the school against the evil practices which had for so long been carried on. The result of this was the Honor System. After giving much thought and time in devising means to obliviate this great evil in Sheff, the Student Council recommended the Honor System as the only way in which the ideal could be reached.

This Honor System was submitted to each of the three classes and in every case the vote was almost unanimous. It showed that the student body was ready to support the Student Council. Then the new system was submitted to the faculty, which up to this time had not been consulted upon the matter. The vote of the students in favor of the Honor System convinced the faculty that the student body wanted it. A committee of the faculty was appointed to confer with a committee from the Student Council and to make any changes in the new system which the faculty might think necessary. After three meetings of these two committees, the Honor System was adopted by the faculty at the recommendation of the faculty committee.

The new system was put in effect in the June examinations and met with great success. The Honor System was not instituted so much for the purpose of stopping cribbing as it was to instill into the students a feeling against this practice. The Student Council, when it recommended the system, realized that no system could be effective in stopping cribbing until the general feeling and attitude of the undergraduates were brought up to the point where they frowned upon any sort of dishonesty in the class-room. The Student Council believes that by the Honor System this feeling can be brought about, and that not only will the value of a degree from Sheff be increased, but also the morals of the school will be greatly benefited and uplifted.

The great success of the new system in the spring examinations conclusively proves that the morals of the men in Sheff are no lower than in any other college and that the Honor System will work just as successfully here as it has in other places.

Now the question arises: what are the incoming Freshmen going to do with this Honor System? Are they going to support the Student Council which has held itself responsible for the carrying out of the system, or are they going to break down the good beginning which has been made by the upper classmen? Remember, Freshmen, that in two years you will run the affairs of Sheff; you will be the leaders in all her activities. In two years all the responsibilities will be handed over to you. Are you going to make yourselves worthy of this trust? If so, then it is your duty, not only to Sheff, but to yourselves, to do all in your power in the next two years to make this Honor System a success in every sense of the word, so that, when you become Seniors and assume the responsibilities of the school, you can do so with a clean conscience and with the knowledge that your actions have been above board and sincere during the past two years. Then, and only then, can you influence the lower classes without the taint of hypocrisy.

Following are the rules which govern the Honor System:

## ARTICLE I.

Section 1. There shall be an Honor System in the Sheffield Scientific School.

## ARTICLE II.

Section 1. The Honor System shall apply to all undergraduate students of the School.

Sec. 2. The Honor System shall apply to all examinations and papers written in class.

Sec. 3. To each written paper the following signed pledge shall be appended:

> "I hereby pledge my word of honor that
> I have neither given nor received aid dur-
> ing this examination."

Sec. 4. No paper without signed pledge shall be marked as credited work.

## ARTICLE III.

Section 1. There shall be an undergraduate Discipline Committee of nine members to which all criticisms and complaints may be addressed.

Sec. 2. The Committee shall be composed of the three Senior Class Deacons, the three Junior Class Deacons, and three members chosen from and by the Student Council during the first month of the Fall Term.

Sec. 3. 1. The officers of the Committee shall be a Chairman and a Secretary, who shall hold office for one year.

2. The officers shall be elected during the first month of the Fall Term by a majority of the members of the Committee.

3. The Chairman shall be elected from the Senior members, and the Secretary shall be elected from the Junior members of the Committee.

4. The Chairman shall preside at all meetings. In case of his absence, the Committee shall elect a Chairman *pro tem.*

5. All meetings shall be called by the Chairman or by a written notice signed by three members of the Committee. Not less than two days' notice shall be given of the time and place of said meetings.

6. The Secretary shall keep the minutes, have custody of the Committee records, and conduct the correspondence.

Sec. 4. The punishment of any violation of the Honor System shall be by and at the discretion of the Committee and shall be final.

Sec. 5. Any punishment inflicted by this Committee shall be the result of the unanimous vote of the members present.

Sec. 6. A quorum shall consist of eight members.

Sec. 7. The required vacancies shall be filled by the Student Council provided no quorum can be had.

## ARTICLE IV.

Section 1. An accused shall be present at the examination of all witnesses.

Sec. 2. Witnesses shall be examined separately when called before the Committee.

Sec. 3 .A member of the Committee accused of the violation of the Honor System, shall cease to act as a member of said Committee until his individual case is determined.

ARTICLE V.

Section 1. The rules governing the Honor System may be amended by the three-fourths vote of the Student Body.

* * *

## EXTRA CURRICULUM

THE Class of 1915 S before entering Yale University has undoubtedly heard many references to Yale "spirit". Now this spirit is an element difficult to define, but it has only achieved the prominence which it holds through the activities of the men who have persistently and earnestly worked, not only in their studies, but in extra curriculum activities. Here they have worked in harmony and unity with other men, each one helping the other in the formation of his character, for we are to a certain extent the work of each other's hands.

In athletics, football practice commences immediately, and fall crew, track, and baseball practice will soon be under way. If a man is not athletically inclined, there are a vast number of other fields in which he can engage. The trials for the 'varsity musical clubs are held very shortly, and also those for the Apollo and Freshmen clubs. The Christmas play also offers a chance to many men. Newspaper heeling is of great importance and offers many unrealized opportunities. The Sheff Y. M. C. A. requires many men each year to carry on its industrial work, and teachings. In the minor sports, hockey, basketball, swimming, gymnastics, soccer, golf, tennis, fencing, wrestling, and the gun team, follow along in rapid succession. The above shows the number of opportunities open to a man.

The main point is get out and do something. It may require a little effort on your part, but take the initiative and seize the opportunities presented. The lasting friendships formed and

the acquaintances you make will prove a most valuable asset in after years. This is perhaps the best way to meet the men of your class. Therefore, it is absolutely essential that every man should identify himself with some outside interest. There are plenty of branches to choose from, so select one immediately. Go at it in full earnestness, and you will be the gainer in the end. Since you expect to get so much out of Yale, the least she can do is to expect every man to do his duty.

* * *

## THE ENGINEERING CLUBS

IN the Engineering Clubs of the School will be found organizations which are both enjoyable and useful, and it is strongly urged that all men who expect to take engineering courses or who are at all interested in engineering topics avail themselves of the opportunities offered by membership.

There are two such clubs, one for the Mechanical and one for the Electrical Engineers. They are both organized branches of the national organizations known respectively as the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, and are stepping stones to these larger organizations after college. Meetings are held monthly or bimonthly, at which engineering topics of vital interest are presented either by men who are recognized leaders of their engineering profession or by the students themselves.

The meetings thus serve not only to educate the members in important engineering matters of the day, but also to show how men in the outside world are making practical use of the theories which are learned in college. The members become acquainted with these distinguished men of the profession, become familiar with the general workings of such an organization, and gain some information as to the most effective manner in which to present a paper before a body of men. Not the least advantage offered by these organizations is the close personal contact and spirit of friendship between the undergraduates and the heads of the Engineering Departments of the School fostered by

the informal gatherings which usually follow the regular meetings.

The success of the clubs was encouraging last year, but they still offer unrealized possibilities which demand the hearty coöperation of every Engineering student.

* * *

## THE SHEFF RUSH

THE incoming class is introduced to Sheff on the first Saturday night of the college year. Early in the evening the Seniors meet upon the steps of Byers Hall and are photographed in all the splendor of make-ups, which vary from chorus-girls to convicts.

This ceremonial over, the classes assemble and, led by a band, march out Hillhouse Avenue and Prospect Street to Observatory Hill. Here three wrestling bouts are held, one in each of the heavy weight, middleweight, and lightweight classes. Representatives are called out from the Junior and Freshman classes, and victory goes to the class winning two bouts. After this comes the march back to town, and finally the rush in Wall Street.

No man can appreciate until he has enjoyed it the wild, good fun of Rush Night. The glare of smoking torches; the singing of college songs; the rythmic swing of a snake dance, and the frenzied rush through Wall Street; all these will later be cherished as memories of early days at Yale.

* * *

## COMMUNICATIONS

In order to promote a better feeling and obtain the views of Sheff men, the editors solicit signed communications on any subject relating to University life. Such communications will be published and the author's name appended if he so desires. We wish it understood, however, that the editors will not hold themselves responsible for the sentiments thus expressed.

# SIGMA XI

*Professor J. W. Roe.*

THE least clamorous of all the activities opening out before a man as he enters college is the one for which he comes to college—studies. No huge-chested captain or coach, whose name headlines a yellow journal urges or browbeats his teacher into two points extra on a test. A clean cut "rush" in class does not bring a grandstand to its feet, and yet it is right here that the most satisfactory and enduring rewards of college life are formed. The ideals which appeal at the beginning of college life change, slowly but steadily, mature and grow more sane. For a number of years the Academic statistic papers have contained the question, "Which would you rather win, a 'Y' or a Phi Beta Kappa key?" While the vote is divided, the majority, we believe in every case, have said that they would prefer to win the key. This is not necessarily death-bed repentance on the part of those who have had their fling and are now willing to profess high-browed virtue.

The same is true on this side of Elm Street. Sigma Xi, the honorary society in the great engineering and scientific schools throughout the country, gives its elections to undergraduates in the latter part of the Senior year. The basis of that election is "promise of success in science, pure or applied". An undergraduate has had no opportunity to demonstrate rare qualities by the accomplishment of research or unusual scientific achievement. Selection must be made mainly on a basis of promise, and the grades attained in the college work up to the time of election form the principle data on which judgment is based. Marks, however, are not the only things considered. The mental attitude, the capacity for clear, sustained, and effective thinking, the personality in so much as it makes for or against success, all enter.

These qualities are honored anywhere; and the badge of Sigma Xi is honored and prized throughout the School. It is worth working for, not only for what it brings, but for what the sustained struggle to win it brings in increased mental power.

Few underclassmen prize mental pre-eminence very highly at first, but they have no realization of the value upperclassmen place on it when it is coupled with other qualities, like personal magnetism, the spirit of leadership, and social charm.

Everything a freshman can do in extra curriculum work, in athletics especially, has added value, when there is shown with it tangible evidence of a clear, powerful mind.

Sigma Xi is one of the highest honors open to an undergraduate and the one which will give him the most permanent satisfaction. Those who win must do good work from the start, the moral of which is—begin *now.*

CAPTAIN SPAULDING

OF THE YALE UNIVERSITY FOOTBALL TEAM, 1912.

# HONORS AWARDED TO STUDENTS OF THE SHEFFIELD SCIENTIFIC SCHOOL, 1911-1912

## CLASS OF 1912

GENERAL THREE-YEAR HONORS FOR EXCELLENCE IN ALL STUDIES.

Harold Page Baldwin (Forestry), Naugatuck, Conn.
James Francis Cobey (Biology), New Haven, Conn.
Frederick Collin Crosby (Civil Engineering), Grand Rapids, Mich.
Donald McRuer Eddy (Chemistry), Bay City, Mich.
Philip Raymond Gleason (Metallurgy), South Norwalk, Conn.
Proal Judson, Jr., (Civil Engineering), Deep River, Conn.
Charles Barstow Langdon (Mechanical Engineering, Hartford, Conn.
Henry Monroe Lathrop (Civil Engineering), Shelton, Conn.
Max Herman Levine (Sanitary Engineering), Hartford, Conn.
Francis Linton Martin (Select), Chattanooga, Tenn.
Hovsep Kevork Missirian, B.A. Central Turkey College 1908 (Electrical Engineering), Aintab, Turkey.
Louis Herman Nachamofsky (Biology), Hartford, Conn.
Ernest Leslie Osborne (Civil Enginering), Denver, Mo.
Clarence Graham Pardee (Civil Engineering,) Cheshire, Conn.
Lucian Platt (Mining Engineering), Baltimore, Md.
Wilton Dubinstein (Select), St. Louis, Mo.
Dominic Ruotolo (Mechanical Engineering), New Haven, Conn.
Joseph Russo (Biology), New Haven, Conn.
Francis William Schmidt (Mechanical Engineering), New Britain, Conn.
Walter Moody Scott (Chemistry), Pequabuck, Conn.
John Woolslair Shallenberger (Electrical Engineering), Beaver, Pa.
Walter Hallett Starkweather (Civil Engineering), New Haven, Conn.
Josiah Donald Thompson (Mining Engineering), East Liverpool, O.

GENERAL TWO-YEAR HONORS FOR EXCELLENCE IN ALL STUDIES.

Edward Raymond Backus (Select), Minneapolis, Minn.

Harrison Valentine Bailey (Forestry), Burlington, Vt.
Raymond Frank Baker (Civil Engineering), New Britain, Conn.
Raymond Brower Bowen (Select), Buffalo, N. Y.
Julius Cohen (Select), New Haven, Conn.
Addison Julius Parry (Select), Indianapolis, Ind.

GENERAL ONE-YEAR HONORS FOR EXCELLENCE IN ALL STUDIES.

George Francis Hughes (Metallurgy), Bridgeport, Conn.
John Russel Leahy (Select), New Haven, Conn.
Charles Stanley Mead (Mechanical Engineering), Everett, Mass.
Theodore Samuel Parsons (Select), Troy, Pa.
Harry Cushing Piper (Select), Minneapolis, Minn.
Donald Seymour Tuttle (Select), Naugatuck, Conn.
Everett Oyler Waters, B.A. Yale University 1911 (Mechanical Engineering), New York City.

HONORS IN SPECIAL STUDIES AWARDED TO STUDENTS NOT RECIPIENTS OF GENERAL HONORS.

Robert Horth Cornell, Jamestown, N. Y., in History and Social Sciences.
Francis Lawrence Edward Driscoll, New York City, in Social Sciences.
Clive Palmer Jaffray, Minneapolis, Minn., in History (two years).
Charles Harry Nielson, Berkeley, Cal., in Biological Sciences.
J. Reuben Piranin, Middleboro, Mass., in French.
John Remick, East Braintree, Mass., in German (two years).
William John Shaefer, New Haven, Conn., in Spanish (two years).

RECIPIENTS OF THE SHEFFIELD GRADUATE SCHOLARSHIPS.

James Frederick Brown, 2d, Denver, Colo.
Wilbur Lucius Cross, Jr., New Haven, Conn.
Daniel Cushing, Lowell, Mass.
Charles Brand Officer, Claremont, N. H.
Joseph Russo, New Haven, Conn.
John Seward Sherman, Orange, N. J.

PRIZES.

For Excellence in Civil Engineering—Clarence Graham Pardee, Cheshire, Conn.

For Excellence in Electrical Engineering—John Woolslair Shallenberger, Beaver, Pa.

For Excellence in Mechanical Engineering—Francis William Schmidt, New Britain, Conn.

For Excellence in Mining Engineering—Lucian Platt, Baltimore, Md.

For Excellence in History—Francis Linton Martin, Chattanooga, Tenn., with honorable mention of Wilton Rubinstein, St. Louis, Mo.

The Belknap Prize in Biological Studies—Joseph Russo, New Haven, Conn.

The Belknap Prize in Geological Studies—Philip Raymond Gleason, South Norwalk, Conn., with honorable mention of Lucian Platt, Baltimore, Md.

The Tucker Prize in Sanitary Engineering—Max Herman Levine, Hartford, Conn.

### CLASS OF 1913

GENERAL TWO-YEAR HONORS FOR EXCELLENCE IN ALL STUDIES.

Waldemar Enoch Anderson (Electrical Engineering), Stamford, Conn.

Henry August Behre (Mining Engineering), Brooklyn, N. Y.

Robert Newton Blakeslee (Electrical Engineering), Bridgeport, Conn.

George Vanderbilt Caesar (Chemistry), Tacoma, Wash.

Frederick Bryan Chamberlin (Civil Engineering), Unionville, Conn.

Alfred Stanley Curtis (Mechanical Engineering), Colorado Springs, Colo.

Frank Baldwin Doolittle (Civil Engineering), Mt. Vernon, N. Y.

Sutherland Cook Dows (Select), Cedar Rapids, Ia.

Thomas Wentworth Foote (Select), Plainfield, N. J.

Sidney Edward Hadley (Chemistry), Wallingford, Conn.

Earle Heaton Hemingway (Chemistry), North Haven, Conn.

Henry Walter Hicock (Forestry), Southbury, Conn.

Chase Hamblet Knowlton (Mechanical Engineering), New Haven, Conn.

Charles Ayling McCluskey (Civil Engineering), New Haven, Conn.

Eugene Edward Oviatt (Civil Engineering), Bristol, Conn.

Arthur Phillips (Chemistry), New Haven, Conn.

Joseph Ernest Rapuano (Civil Engineering), New Haven, Conn.

Austin Bryant Reeve (Mecanical Engineering), Chicago, Ill.

Walter Charles Schmidt (Mining Engineering), New Britain, Conn.

Frost Snyder (Select), Tacoma, Wash.

Theodore Torrey (Mechanical Engineering), South Weymouth, Mass.

Francis White (Select), Baltimore, Md.

Rudolph Harold Willard (Electrical Engineering), New Haven, Conn.

Harold Adamar Wintjen (Chemistry), Mt. Vernon, N. Y.

GENERAL ONE-YEAR HONORS FOR EXCELLENCE IN ALL STUDIES.

John Adams Arnold (Mechanical Engineering), Stamford, Conn.

James Turner Baird, Jr. (Mechanical Engineering), New Haven, Conn.

Alexander Wallace Chauncey (Select), Brooklyn, N. Y.

Arthur Merton Chickering (Zoology and Botany), St. Johnsbury, Vt.

Joseph Andrew Glover (Select), New Britain, Conn.

William Augustus Hamann, Jr. (Mining Engineering), Mt. Vernon, N. Y.

William Bradford Joyce, Jr. (Select), New York City.

Kenneth Fletcher Lees (Mechanical Engineering), Shelton, Conn.

Francis Thomas Aloysius McDonough (Civil Engineering), New Haven, Conn.

Russell Alexander Meyrowitz (Select), New York City.

Givens Archer Parr, B.A. Southwestern University 1911 (Mining Engineering), San Diego, Texas.

Alvin Louis Smith (Mechanical Engineering), Cedar Hurst, L. I., N. Y.

Philip William Swain, B.A. Syracuse University 1911 (Mechanical Engineering), Bridgeport, Conn.

Emanuel Maurice Thalheimer (Chemistry), New Haven, Conn.

HONORS IN SPECIAL STUDIES AWARDED TO STUDENTS NOT RECIPIENTS OF GENERAL HONORS.

Edward Letellier Aldworth, Grand Rapids, Mich., in Mathematics (5)*.
Harvey Wilmot Black, Alton, Ill., in English (5).
William Hugh Burns, Willimantic, Conn., in German (6) (two years).
Edward Homer Buxton, Warsaw, N. Y., in German (6) (two years).
Philip Davidson, Waterbury, Conn., in Languages (6).
Antonio DiDio, New Haven, Conn., in French (6) (two years).
Darwin Lathrop Gillett, Westfield, Mass., in History and Social Sciences (6).
Richard Philip Hart, 2d, New Haven, Conn., in Mathematics (5)
William Burr Hill, Jr., Brooklyn, N. Y., in Languages (6).
Maurice Leopold Horner, Jr., Chicago, Ill., in Languages and Literature (5).
Howard Barker Lee, Detroit, Mich., in Social Sciences (5).
Hewstone Knight Raymenton, Worcester, Mass., in Languages and Literature (10).
Jerome Cohen Saltzstein, Milwaukee, Wis., in History and Social Sciences (6).
James D. Trask, Jr., Highland, N. J., in Biological Sciences (7).
Alexander Wellington, Waterbury, Conn., in Languages (6).
Harold Long Williamson, Chicago, Ill., in English (5).

THE ROGERS SCHOLARSHIP.

For Excellence in the Studies of the Chemical Course, awarded to George Vanderbilt Caesar, Tacoma, Wash.

THE PENFIELD PRIZE.

For Excellence in Mineralogy, awarded to Walter Charles Schmidt, New Britain, Conn.

STONE TRUST CORPORATION SCHOLARSHIP PRIZES.

Prize in Mathematics, of One Hundred Dollars, awarded to Rudolph Harold Willard, New Haven, Conn., with honorable mention of John Adams Arnold, Stamford, Conn., and Alfred Stanley Curtis, Colorado Springs, Colo.

Prize in German and Spanish, of One Hundred Dollars, awarded to Walter Charles Schmidt, New Britain, Conn., with honorable mention of William Burr Hill, Jr., Brooklyn, N. Y.

Prize in English Composition, of One Hundred Dollars, awarded to Nathan Peixotto Bloom, Louisville, Ky., for a one act play entitled *The Bypaths of Justice*.

* Weighted year hours.

## CLASS OF 1914

### HONORS FOR EXCELLENCE IN ALL STUDIES OF THE FRESHMAN YEAR.

Joseph Edmund Barker, Troy, Pa.
Herbert Arthur Bedworth, Bridgeport, Conn.
Alfred Abraham Berkowitz, New Britain, Conn.
Azel Fiske Blake, New Haven, Conn.
Jerome Burtt, Los Angeles, Cal.
Charlton Newlin Carter, Plainfield, Ind.
Paran Moody Clarkson, Jacksonville, Fla.
Kenneth Gaston Collins, Springfield, Mass.
John Donald Currie, Detroit, Mich.
Ralph Livingston Dickey, New York City.
Max Henry Foley, Norwich, Conn.
Howard Wilcox Haggard, Columbus, Ind.
Leo Joseph Hahn, New Haven, Conn.
Harold Smalley Houston, New Haven, Conn.
Henry Hand Hun, Albany, N. Y.
Albert Emanuel Johnson, Hartford, Conn.
Lincoln Johnson, Worcester, Mass.
Myron Marsh Johnson, Winchester Center, Conn.
Gardiner Luce, Melrose, Mass.
Charles Thomas Melvin, Bethel, Conn.
Paul Fox Murdock, Westbrook, Conn.
Harmon Francis Newell, Chicago, Ill.
William Mayo Newhall, Jr., San Francisco, Cal.
David Burr Porter, Montclair, N. J.
Henry Reichgott, New Haven, Conn.
Eldon William Sanford, Hamden, Conn.
James Ralph Scott, New York City.
Arthur Anderson Ticknor, Athol, Mass.

Wesley Durand Tomlinson, Shelton, Conn.
Pierson Muir Tuttle, Rockaway, N. J.
Russell Gillette Warner, New Haven, Conn.
John Randel Weeks, Jr., New York City.
Rodney Wellington Williams, Tompkinsville, N. Y.
William Lowthian Spencer Williams, Kahului, H. I.

### HONORS IN SPECIAL STUDIES AWARDED TO STUDENTS NOT RECIPIENTS OF GENERAL HONORS.

Bernard Holbrook Bailey, Sharon, Mass., in Chemistry.
Carroll Smith Bayne, South Orange, N. J., in German.
Harrie Lawrence Benjamin, New Haven, Conn., in Drawing.
Myron Kerr Blackmer, Denver, Colo., in French.
Lester Daniel Chirgwin, Ansonia, Conn., in Mathematics.
Benjamin Aubrey Conklin, Montclair, N. J., in Mathematics.
Nelson Bryant Cooper, Great Falls, Mont., in English Literature and Composition.
Dwight Clark Daniels, Worcester, Mass., in Drawing and French.
Sidney Wilfred Edmonds, Roslindale, Mass., in Spanish.
Frederick Hall Fischer, New Orleans, La., in English Literature and Composition.
William Smith Fowler, Springfield, Mass., in Chemistry.
Elvin Lewis Graether, Bridgeport, Conn., in German and Mathematics.
Woodward Livingston Harlow, New Haven, Conn., in Mathematics.
Frederic Gregory Hartswick, Clearfield, Pa., in English Literature, Composition, and French.
Jonathan Hunt, Hot Springs, So. Dak., in English Literature and French.
Harold MacKnight Hunter, Fulton, N. Y., in German.
William Allen Hunter, Savanah, Ga., in French.
Kenneth Burr Jones, Cranford, N. J., in Drawing and Mathematics.
Manuel Wilson Kligerman, New Haven, Conn., in German.
Austin LeBoutillier, High Bridge, N. J., in Chemistry.
Roderick James McIntosh, Tuxedo Park, N. Y., in German.
Wilbur Fisk McLean, Duluth, Minn., in German.

Robert Carson Martin, Pittsburgh, Pa., in Chemistry.
Malcolm Robertson Pitt, Stamford, Conn., in German.
Frederick Rapoport, New Haven, Conn., in Chemistry.
Raymond Edward Reichelt, Maywood, Ill., in Drawing.
Reginald Lincoln Ripley, Hingham Center, Mass., in Mathematics.
David Malcolm Robinson, Warehouse Point, Conn., in Drawing.
Lowell Palmer Rush, Oil City, Pa., in Chemistry and German.
Samuel Herman Shapiro, New Haven, Conn., in Chemistry.
Brooks Shepard, Cleveland, O., in French and Physics.
Carroll Willd Smith, Berkeley, Cal., in German.
Max Sorson, Brooklyn, N. Y., in French.
William Shelton Sturges, Jr., Shelton, Conn., in German.
Edmund Louis Sussdorff, Brooklyn, N. Y., in Chemistry.
Albert Emil Thorpe, New Haven, Conn., in Chemistry.
William Carlisle Turner, Wicomico, Md., in French.
Paul Barbeau Vallé, Philadelphia, Pa., in English Literature and French.
Thomas Wheeler, West Hartford, Conn., in Drawing and Chemistry.
Thomas Whitside Wilbor, Jr., New Britain, Conn., in English Literature and Composition.

PRIZES.

For Excellence in all the Studies of Freshman Year, Engineering Science Group—William Lowthian Spencer Williams, Kahului, H. I.

For Excellence in all the Studies of Freshman Year, Natural Science Group—Pierson Muir Tuttle, Rockaway, N. J.

For Excellence in Physics—William Lowthian Spencer Williams, Kahului, H. I., with honorable mention of Pierson Muir Tuttle, Rockaway, N. J.

For Excellence in Chemistry—Chemistry B.—Pierson Muir Tuttle, Rockaway, N. J., with honorable mention of Henry Hand Hun, Albany, N. Y. In Chemistry A.—Charles Thomas Melvin, Bethel, Conn., with honorable mention of Max Henry Foley, Norwich, Conn.

For Excellence in Mathematics—Kenneth Burr Jones, Cranford, N. J., with honorable mention of Henry Reichgott, New

Haven, Conn., and William Lowthian Spencer Williams, Kahului, H. I.

For Excellence in Drawing and Descriptive Geometry—Paul Fox Murdock, Westbrook, Conn., with honorable mention of William Lowthian Spencer Williams, Kahului, H. I.

For Excellence in German—Pierson Muir Tuttle, Rockaway, N. J., with honorable mention of Harold Smalley Houston, New Haven, Conn., and Jerome Burtt, Los Angeles, Cal.

For Excellence in French—William Lowthian Spencer Williams, Kahului, H. I., with honorable mention of Alfred Abraham Berkowitz, New Britain, Conn.

For Excellence in English Literature—Pierson Muir Tuttle, Rockaway, N. J., with honorable mention of James Ralph Scott, New York City, Rodney Wellington Williams, Tompkinsville, N. Y., and William Lowthian Spencer Williams, Kahului, H. I.

For Excellence in English Composition—Pierson Muir Tuttle, Rockaway, N. J., with honorable mention of Frederic Gregory Hartswick, Clearfield, Pa.

For Excellence in Biology—Divided between James Ralph Scott, New York City, and Pierson Muir Tuttle, Rockaway, N. J., with honorable mention of Howard Wilcox Haggard, Columbus, Ind., and Eldon William Sanford, Hamden, Conn.


CAPTAIN ARTHUR HOWE

OF THE YALE UNIVERSITY FOOTBALL TEAM, 1911.

# FOOTBALL

*Arthur Howe.*

IT takes the average new-comer at Yale about a year and a half to size up the situation. The glorious idea of getting into college often carries a man completely off his feet. There are entirely too many of us who feel that a rest is due after our four years of hard preparation for Yale. We have been looking forward to, and hearing about, that "grand college life", and at last we have a chance to float around in it. It is this feeling of satisfaction that too many fellows are being content with. Altogether too many, who have been leaders in prep. school, are sitting down and enjoying this fine prize, which some never win and others take years to acquire.

This may seem to you like a sermon, but call it what you will, it is a hint which might be dropped in the way of everybody who has any ambition to help his college. Boiled down, it means this: Yale hates a loafer, always has, and always will. I do not mean to call everybody a loafer, but I should like to have every Freshman understand that his start in college will determine whether Yale will be calling him one in a year or so, or not. Nobody can tell you what to go out for, but if you are to be of any use to any Yale institution you must keep up in your studies. I know this is an old story, but it becomes a sadder tale every year. Any man who gets down in his work is useless on the field or in an office, and the sooner we realize this, the better. To give all you have to Yale, get the studies right first. After that go into your particular calling for all you are worth. If you don't win out yourself, you will make someone else be a better man to get the job.

There are all kinds of men at Yale, but we do not like to call them all Yale men. There is something in the latter title which we cherish and apply only to such as win and deserve it by their efforts.

As for football, remember that many men make the 'varsity who have never been on their Freshman team, also that some

men never come out because they think the competition looks hard, and lastly some cannot come out, because their studies are too low. If you know, hear of, or are, one of that type, stop and think what might be your particular duty while at Yale.

I know this will be read quickly and probably more quickly forgotten, but it is the opinion of more than one graduate and one which you will have to answer in order to add anything to Yale. The opportunity is yours; use it as you would have your respected friends see you use it. If you make a sincere solution you will be worth something to Yale.

ARTHUR HOWE, 1912.

YALE UNIVERSITY FOOTBALL TEAM, 1911.

## TRACK

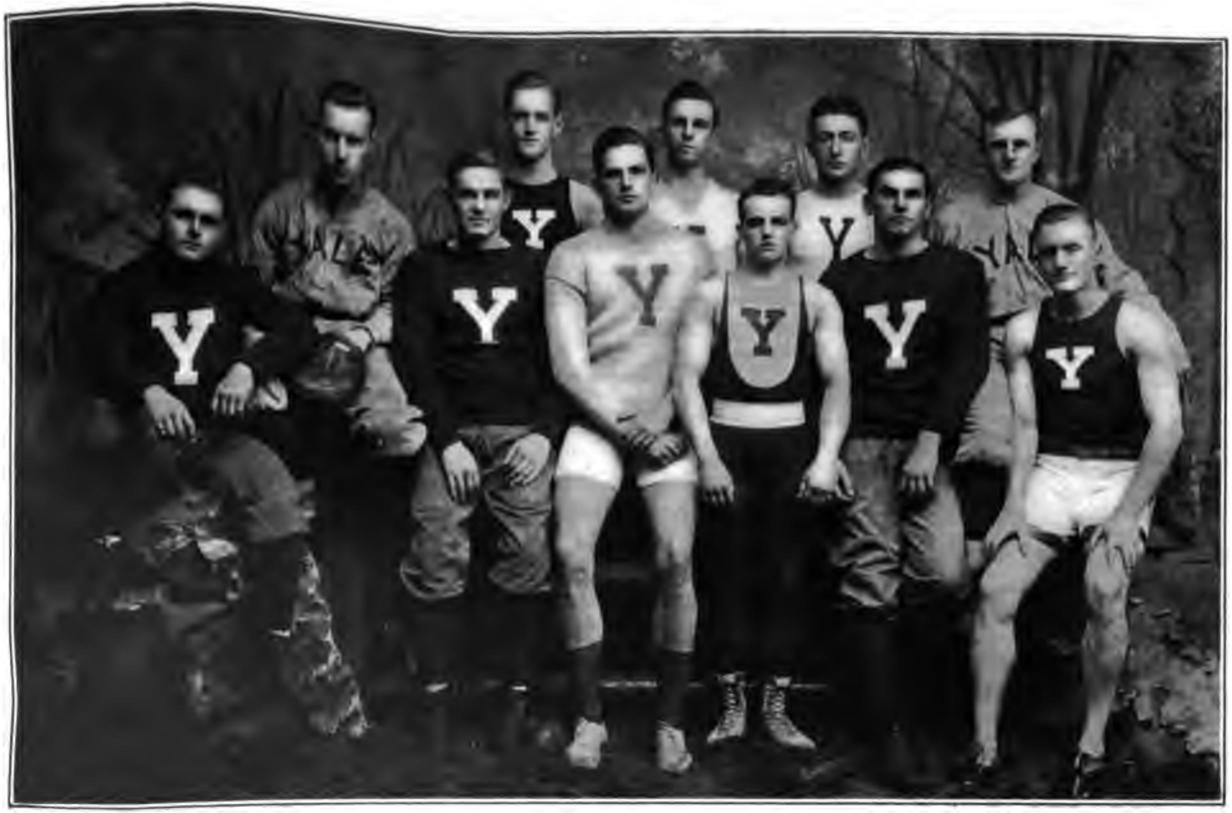
*R. J. Holden.*

IN writing on the subject of Track work there are two points which stand out most prominently in my mind, which, if given some consideration, should be of use to any one in deciding whether or not he should go out.

The first, that of health, is perhaps of no less importance than the second which I will take up. Track work, like any other outdoor sport, is healthful, but its added advantages are in my mind even greater than those of any of the other sports. The muscles, which you use are not all of one portion of the body, but every part of the entire body comes into play and is built up.

The second point is the winning of the "Y." To win a "Y" in track depends upon your own individual effort and your own work. You have no team mates who help you to win your event, for you must yourself be able to come in first. But one need never be afraid of lacking the natural ability to perform, for he can be taught, and if he works consistently, can win. I shall venture to make as broad a statement as this: Any fellow of average ability who wants a "Y" and comes out Freshman year to begin working for it and works conscientiously, will, by Senior year have it. I do not make this statement rashly, for I have seen it work out in more cases than one, but the fellow has worked hard all the time.

On the other hand, a fellow with a little ability can develop that which he has to a surprising degree, if he takes the advice of his trainer and coach and uses a little judgment on his own part. You never really know just how much ability you have until you at least give yourself a "try-out".



SHEFF "Y" MEN.

## BASEBALL

*Frank B. Quinby.*

IF the plans of the Committee of Twenty-one are realized, and it seems there is no real doubt but that they will be, Yale will have a thoroughly up-to-date athletic equipment. When this much to be desired result is obtained Yale's athletics will probably be entirely in charge of Yale men, and the slogan will be Yale athletics coached by Yale men for Yale men. The new fields and athletic facilities should surely mean the participation in some sort of athletics by practically all of the students, and each man should see to it, for his own sake and the sake of Yale, that he does his part in the athletic life of the place.

In baseball, through the establishing of two new diamonds, considerable interest was awakened in the class series in May, the winning team was awarded numerals, and it is hoped that another series may be played this fall. These class teams are the stepping stones to the College and University teams, and to make one of them brings the player at once to the attention of the University captain and coach, whereas if a man has not been on a class team the captain or coach give him scant notice, taking it for granted he was not of sufficient ability. The desired ends, then, appear to be realized in new fields and a new system, which should bring out all men athletically inclined to their favorite sports and add very materially to Yale's prestige in athletics.

YALE UNIVERSITY BASEBALL TEAM, 1912.

## CREW

THE first call for crew candidates from the Class of 1915 S. will soon be issued. In this an excellent opportunity is offered to men who intend to take up rowing to get a good start. During the fall crews are selected to represent the Sheff and Academic classes and a regatta is held on the harbor. Again early in January another call is issued and any man coming out then for the first time will receive as much attention and individual coaching as those who were out in the fall. For some weeks practice is held on the machines and in the tanks, followed by a long steady grind on the harbor, until the final squad is selected for Gales Ferry in May or June. These men row against the Harvard Freshmen and receive numerals.

YALE UNIVERSITY CREW SQUAD.

## HOCKEY

*A. Harman.*

WITH the completion of the Rink immediately before the season of 1912 commenced in earnest, Hockey was placed upon a new and sound basis at Yale, hitherto unrealized but frequently conjectured. For many years Freshmen teams had struggled along with but scanty opportunity for practice and, as a result, were in all but one instance beaten by Harvard. On the other hand, last year, good material being available and almost daily games being played with the 'Varsity, a combination was developed which went through the season without defeat, beating among others the Harvard and Princeton Freshmen and St. Paul's School of Concord. There is no reason now, why this outcome cannot be had every year in the future. Besides the pleasure of playing, very good experience may be gained for those men who wish to try for the University team after their first year.


YALE UNIVERSITY HOCKEY TEAM, 1911-1912.

# THE SHEFF Y. M. C. A.

*Lawrence Achilles.*

THE motto of the Sheffield Christian Association is the golden rule: "Do unto others as you would have them do unto you." There is nothing more satisfying than the realization that one has done something to make someone else happy.

Though the Yale Spirit is intangible it is said to consist largely of these qualities: unselfishness, democracy, and hard work. A narrow and self-centered individual, mathematically speaking, is like a decreasing variable approaching zero as its limit. He is too small to reckon or trifle with. In sharp contrast to the self-centered type are the men who embody broad-mindedness and a good democratic spirit. In the third place, the hard, conscientious workers reap their due rewards,—for the world admires and approves this characteristic.

It has been well said: "Plan your work and then work your plan." The Christian Association has planned its work but it does not want to be a one man affair. No one likes to see a weak Christian Association. Therefore let us ask ourselves individually at the beginning of this new year if we are doing something to make our Association strong and virile.

The opportunities for putting our creed into practice are innumerable. We need men to teach groups of boys everything from the first essentials of right living up to the principles of wireless telegraphy and the construction of aeroplanes. In our Boys Clubs the age limits run from six to twenty-one, so a leader can choose the kind of boys with whom he prefers to work. The Industrial Work brings us into close and intimate contact with the various nationalities of foreigners that are in New Haven. This intimate relationship facilitates our getting their point of view and men taking the mining and engineering courses can ill afford to graduate without doing some of this work. The Yale Hope Mission—55-59 Court Street—is an extensive plant and one well worth seeing. Information regarding any branch

of the work can be obtained from the General Secretary on the second floor of Byers Hall.

This year Professor Roe will speak in rotation according to a fixed schedule, at the various fraternity and society houses. In this way more men will be reached and better fellowship will result, as the fraternites and societies extend a warm welcome to all Juniors and Seniors in the Scientific School. Dean Brown of the Divinity School will give a practical talk to the Freshmen only, on the second of Byers Hall every Friday night during the Fall Term. Special attention is also called to the University Y. M. C. A. meetings which are held in Byers Hall every Wednesday evening at 6.45. These meetings are addressed by prominent speakers of the day and they are open to men in every department of the University. As they are held in Byers Hall under the auspices of the Sheff Y. M. C. A., their success depends largely on the attendance of the men from the Scientific School.

Remember the motto: "Do unto others as you would have them do unto you," and give the Y. M. C. A. your best physical, mental, and moral support.

## THE YALE UNIVERSITY DRAMATIC ASSOCIATION

UNLIKE the dramatic associations at some of the other colleges, the Yale Dramatic Association has certain well-defined aims and ideals. It is not merely a social organization for the promotion of good-fellowship among its members but it exists for the purpose of producing plays of distinctly literary merit and to produce them as well as it can. Its repertoire is chosen from plays which otherwise would be seldom seen on the American stage.

Two plays a year are presented. One during Christmas vacation, when an extensive tour of the country is made, concluding with a performance in New Haven during Prom week, and the other at Commencement in the open air on the college Campus. All profits from these performances are set aside for the purpose of accumulating a fund for building a Yale theater. Membership in the Association is one of the most sought after opportunities of the extra-curriculum activities, and the training and experience in the drama thus acquired is exceptionally valuable. Membership is open to both Sheff and Academic men.

* * *

## 1912 FOOTBALL SCHEDULE

Wednesday, September 25.—Wesleyan at New Haven.
Saturday, September 28.—Holy Cross at New Haven.
Saturday, October 5.—Syracuse at New Haven.
Saturday, October 12.—Lafayette at New Haven.
Saturday, October 19.—West Point at West Point.
Saturday, October 26.—Washington and Jefferson at New Haven.
Saturday, November 2.—Colgate at New Haven.
Saturday, November 9.—Brown at New Haven.
Saturday, November 16.—Princeton at Princeton.
Saturday, November 23.—Harvard at New Haven.

## LIBRARIES IN SHEFF

*C. W. Smith.*

AT one time there was in the Sheffield Scientific School a Sheffield Library of considerable size and covering nearly all the necessary reference work for a scientific school, but small departmental libraries have been set up which have drawn from the main library, reducing it to about 7,500 volumes, now kept upstairs in Sheffield Hall. This is known as the Special Technical Library and includes the Hillhouse Mathematical Library of 2,400 volumes, collected after a long series of years by Dr. William Hillhouse, purchased from him by Mr. Sheffield, and presented by the latter to the institution. Students have access only by appointment from the heads of engineering departments, to all prominent scientific journals and the proceedings of academic and scientific societies which can be found in this library. There are also some old works here, most of them purely technical, in complete bound sets, dating back as far as 1819, which make up a very valuable collection. There are books on all sciences written by old English, French, and German philosophers. Besides these, there are rare old dictionaries of music, languages, and sciences; also, agricultural and government journals and reports. This library is for consultation only.

There is also a Chemical Library in the Sheffield Chemical Labratory consisting of about 3,600 volumes. In here may be found the principal chemical journals and periodicals, including some very valuable complete sets reaching back to 1822 and 1824. Most of these are in German, some in French, and some in English. There are some old German chemical abstracts, and the later American abstracts. Here, also, may be found some very helpful dictionaries of chemistry. This library is open to all students for consultation.

The Mechanical Engineering Department Library is located in Room 110, Winchester Hall. This contains about 350 volumes at the disposal of students for reference between 9 a. m. and 5 p. m. on week days. The contents of this library are current numbers and bound volumes of mechanical engineering periodicals,

such as the *Scientific American, Railway Age Gazette, The American Machinist,* and the like. The Electrical Engineering Department Library is in Room 123, Winchester, and contains about 400 volumes of current numbers and bound volumes of Electrical Engineering periodicals. This is also open for reference from 9 a. m. to 5 p. m. on week days. The Civil Engineering Department Library is in Room 132 of the same building. This contains only about 50 volumes of the same general type of books, and is under the same regulations. There is a movement on foot to unite these three collections into one large engineering library and place it with the Physics Library, now numbering about 1,000 volumes, on the second floor of Winchester. It is hoped that this can be realized within a very short time.

On the first floor of Hammond Labratory on Mansfield Street there is a Mining Engineering Department Library. This contains about 600 volumes of the leading mining reports, periodicals and annals. This is likewise open from 9 a. m. to 5 p. m. for reference only. There is a library of geology and physiography in Room 191 of Kirkland Hall on Hillhouse Avenue. This contains about 7,000 volumes, including Professor J. D. Irving's exchanges. Some valuable and important books are contained in it. Students are allowed to use these for reference only, from 9 a. m. to 5 p. m. A pamphlet called *Engineering Periodicals,* containing a list of all the engineering references obtainable in the last five named libraries can be purchased at the Yale Co-öp.

There are also libraries of Biology and Botany, the former in the Biological Labratory, the latter in South Sheffield Hall, containing some bound periodicals and herbarium, and are used by professors and instructors chiefly. Together they contain approximately 1,800 volumes.

In 1909 the movement, which had a long time since been set on foot, to establish a reference library primarily for the students in the select course, was put into active and successful operation. While a member of the Scientific School Professor Henry W. Farnum presented to it a valuable collection of books on Economics, History, Political and Social Science, to be used in connection with the work in those courses. To this collection he has since made some very generous additions. These, together with con-

tributions of other individuals and the school have raised the number of volumes to over 1,500. This library, known as the Farnum Reference Library, is kept in Leet Oliver Hall and is administered, by librarians appointed by the school, as a circulation library. The system has worked very smoothly and with gain in the efficiency of instruction in the subjects involved, which only those directly interested can appreciate, as it includes a large number of duplicates of books in demand. Plans are made to increase the library still further in numbers and efficiency, and it is hoped and expected that this movement, so important to the select course, will continue to grow as it has in the past few years.

The Lounsbury Loan Library is a collection of the text books used in the Scientific School. It was instituted some years ago and named in recognition of the eminent services of Professor Loundsbury in the development of the English courses in the department. It contains at present about 1,000 volumes, but the number is continually fluctuating because of the introduction of new books or new additions of old books. The books are loaned to needy students for the term or year as may be necessary. Although it is seldom that all applicants can be supplied with texts which they require, as no endowment for the library exists, and the librarian is dependent on the generosity of the student-body for necessary additions, many men have been materially aided. Others have been given the opportunity, which they have gladly accepted, to help unobtrusively their fellow-students.

# TUBERCULOSIS IN THE UNITED STATES

*P. R. Anness.*

ALTHOUGH tuberculosis was known as far back as the time of the Greeks and Romans, its cause was not discovered until 1882, when the Bacillus tuberculosis was isolated by Dr. Robert Koch. Prior to the discovery of this bacillus its effects on different parts of the body were regarded as different local diseases. Tuberculosis of the lungs was called "consumption," that of the bones and lyphalic glands was known as "astruma" or "scrofula," that of the skin received the name of "lupus," and that of the intestines was classified as "tabes mesenterica." It is now known that all these so called separate diseases are caused by the Bacillus tuberculosis, and therefore that it is one general disease capable of effecting all parts of the human body.

The economic importance of the study of tuberculosis may be easily realized by a consideration of the fact that in the United States alone there are yearly between one hundred and fifty and two hundred thousand deaths caused by this disease. In his letter to the committee of the International Congress on Tuberculosis in 1908, President Roosevelt said: "The importance of the crusade against tuberculosis, in the interest of which this Congress convenes, can not be overestimated when it is realized that tuberculosis costs our country two hundred thousand lives a year, and the entire world a million lives a year, besides constituting a most serious handicap to material progress, prosperity, and happiness, and being an enormous expense to society, most often in those walks of life where the burden is least bearable."

It was formerly thought that tuberculosis was incurable. Of late years the progress of science in regards to the disease, its causes, effects, and remedies has been remarkable rapid. It is now a generally accepted fact that tuberculosis is both curable and preventable. Although a great number of cures have been effected, the proportion of successes is unfortunately very small in comparison to the number of cases of the disease treated. Thus we are confronted with the problem of stamping out tuberculosis

by prevention. How may the disease be prevented? The answer to this question may be easily seen from a careful observation of its causes and methods of transmission.

As stated above the disease is caused by the Bacillus tuberculosis. This "germ" is transmitted in two ways: either by infection from human sources or by the use of contaminated dairy products. Tuberculosis is not a contagious disease in the sense that smallpox and scarlet fever are contagious. That is, it is not transmissible by mere contact. In general, infection is due to the presence of the bacilli of the disease in the air or on food. The sputa of persons suffering from the disease contains millions of the bacilli. When the sputa dries, the germs float about in the air and are inhaled by anyone who happens to be in the neighborhood. Although this is one method of infection, everyone who inhales the bacilli does not necessarily contract the disease. Flies are a common source of transmission of tuberculosis. They alight on the sputa of diseased persons, and carry on their legs and bodies the bacilli. Should the fly with his death-bearing load happen to alight on any food the latter immediately becomes contaminated. Another method of transmission is the use of public drinking-cups. A tuberculosis patient, using one of these cups, leaves on its edge myriads of bacilli to be carried to the mouth of the next person who drinks out of that cup.

While these methods of human transmission are the most common form of infection, tuberculosis may be contracted from animals. Cattle are subject to the disease. The milk, butter, and other products of a dairy which contains any diseased cattle are sure to be contaminated. Many children are infected with tuberculosis from this source. The danger of this form of transmission of the disease is greatly lessened by the sterilization or Pasteurization of dairy products.

The fact that the disease is transmitted by these methods brings about the natural result that tuberculosis is far more prevalent in cities and centers of population than in rural districts. Poverty, insufficient food, and unsanitary dwellings are always more or less associated with density of population. The air in overcrowded portions of a city is certain to be highly contaminated, while the poverty of the people and the general unsanitary conditions renders them very liable to infection.

These facts regarding the causes and methods of transmission of tuberculosis are of the utmost importance in the crusade against the disease. In fact, the success of such a campaign depends entirely upon a thorough knowledge of these vital facts. In this respect the mortality statistics of the United States, in that they are the only source of information in regard to the actual prevalence of tuberculosis and other diseases, form a most important factor in the fight against the disease. For this reason an attempt is being made to obtain a more complete set of vital statistics. This can be accomplished only by enforcing by law the registration of every death, together with its primary and contributory causes. There is now in the United States a "registration area" in which registration of death and its cause is compelled by law, but this area does not yet cover the whole country. Incomplete as the statistics are, they show the advance made by science in its fight against tuberculosis.

In this fight, the National Association for the Study and Prevention of Tuberculosis has done much good work. In conjunction with many similar State associations they have succeeded in awakening public opinion to the necessity for restricting the ravages of the disease. For this purpose, in 1911, the National Association sent out 7,300 papers on tuberculosis, reaching three or four million readers. The Association obtained the aid of many religious denominations. A remarkable instance of this coöperation is shown by the fact that on April 30th, 1911, over fifty thousand sermons on tuberculosis were preached in various churches throughout the country. This awakening of public opinion has resulted in the passage of many laws tending to improve sanitary conditions.

The passage of these laws is a very important factor in the crusade. Legislation is a very simple and direct means of improving sanitary conditions. In almost every city in the United States there are now laws preventing promiscuous expectoration, prohibiting the use of public drinking cups, and insuring the proper ventilation and sanitation of factories and public schools.

The Association, besides this enlisting of the forces of Church and State in the crusade against tuberculosis, has done much on its own resources. It has increased the number of dispensaries and clinics for the treatment of the disease from 18 in 1905 to 349

in 1911. During the same time the number of sanitaria for tuberculosis has increased from 111 to 422. The Association has also carried on an extensive research work and has provided science with much new and interesting information on this disease.

To this vigorous campaign may be attributed the great improvement in the death rate of the disease during the past thirty years. The following table taken from the mortality statistics of the United States, shows the steadily decreasing rate of deaths caused by tuberculosis:

Death rates from tuberculosis (all forms) in the registration area of the United States.

| Year. | Death rate per 100,000 of population. |
|---|---|
| 1880 | 326.2 |
| 1890 | 267.4 |
| 1900 | 201.2 |
| 1907 | 183.6 |
| 1909 | 167.5 |
| 1910 | 160.3 |

This remarkable improvement is very encouraging. Yet in spite of it, tuberculosis still heads the list of causes of death.

# THE PANAMA CANAL

## HOW THE UNITED STATES ACQUIRED THE RIGHT TO DIG IT

*H. D. Schmidt.*

FOR many years prior to 1903, the United States Government had been negotiating with foreign powers to provide for the building of a Panama Canal. After the conclusion of the Hay-Pauncefote Treaty in 1902, Congress passed an act providing for the construction of a Canal across the Isthmus of Panama. By this act the President was authorized to secure for the United States, from the Republic of Colombia, within a reasonable time and at a reasonable price, the property of the French Panama Canal Company and the perpetual control of a strip of territory across the Isthmus of Panama; if this project failed, he was authorized to adopt the Nicaragua route. The President was successful in making a very advantageous contract with the French company. The contract was advantageous to us in the sense that we only partly recompensed them for the large sums of money that they had expended on the "big ditch", but they got something and, if we had decided not to build the canal, they would not have received anything for their property. Every step in the negotiations for this contract and the payments to the official representatives of the French company were entered into with the utmost care; and every detail connected with these transactions was made public.

Now that we had secured the rights of the French company, and had removed by the Hay-Pauncefote Treaty the difficulties that previous treaties had caused, there still remained some negotiations to be made with the Republic of Colombia, which was then in possession of the Isthmus of Panama. The Hay-Pauncefote Treaty explicitly provided that the United States should build, control, police and protect the Canal; thus our Government assumed entire responsibility for the Canal and guaranteed that it would be built.

Nearly fifty years before this time the United States had announced that it would not permit the country in possession of the Isthmus "to close the gates or interfere" with opening one of the "great highways of the world," or to justify such an act by the pretension that this avenue of trade and travel belonged to that country and that the owners could shut it if they chose. As we had always insisted upon this doctrine, we had no hesitation in making use of it. We entered into a series of negotiations with the representatives of Colombia for a treaty for building a canal; however, the Colombian Government refused to confirm this treaty after their delegates had agreed to it. In this treaty even greater advantages were given to Colombia than were later given to Panama, but Colombia did not realize what had happened, until after we had recognized Panama as a republic, and then strongly endeavored to undo the past and take up the treaty. At this time the Isthmus of Panama was a part of the Colombian Republic. When this republic refused to enter into a treaty with our government the representatives of Panama in the Colombian Congress warned Colombia that the people of Panama would not submit in a quiet way to something which they considered utterly ignored their vital interests. Our government, which had also warned Colombia of the trouble that they were stirring up, was considering the matter of continuing the work in spite Colombia's opposition, when there was a general change in the state of affairs on the Isthmus.

The Isthmus, which has always been noted for its revolutions, was now seething with a revolutionary spirit. This fact is further brought out by the figures that fifty-three revolutions, rebellions, insurrections, and civil wars occurred there within a period of fifty-seven years, and by the incident that for seventy years prior to this time only one or two presidents had served their entire term. In 1846 our Government made its first treaty in regard to the Isthmus of Panama, with a country then known to us as New Grenada. A few years later the Republic of Colombia took the place of New Granada, while Panama, which was then a sovereign power, later became a mere department in the Republic of New Granada or Colombia. Twice there were attempted secessions of Panama and six times marines and sailors

from United States men-of-war were landed to protect property and keep transit across the Isthmus unobstructed, which showed that the Republic of Colombia was incompetent to govern its own country and maintain order in its possessions. We were required to do this duty by a treaty, which gave us certain proprietary rights and sovereign power, which no other nation possessed. Several times our attitude alone prevented interference by European powers, but, nevertheless, Colombia refused to allow us to build the Panama Canal. The people on the Isthmus, however, made our task easier for all the inhabitants and also all the Colombians, even the soldiers that had been sent there, shared the desire of the Panamans for a separate republic.

Many people saw that a revolution in Panama was certainly going to occur, if our projected plan for building the canal fell through. The Government forces at Panama and Colon were friendly to a revolution; hundreds of arms and carloads of ammunition were being rushed there; and Colombia, dreading what was going to occur, was hurrying her own troops to the Isthmus. The President of the United States sent two army officers down there in September, 1903 to ascertain the true state of affairs. They announced that owing to the failure of the Colombian Congress to ratify the Hay-Herran Treaty a revolution was certain to break out, all the people were in favor of it, and trouble could be expected, if the Colombian Congress adjourned without ratifying the treaty. They also added in their report that the revolution would not occur on the Isthmus before the twentieth of October, for the Panamans would not have enough arms before that time. The President immediately sent various naval vessel to the Isthmus with orders—similar to those that had been issued in 1900, 1901, and 1902—to maintain free and uninterrupted transit across the Isthmus, and with this added purpose, to prevent the landing of armed forces with hostile intent at any point within a fifty-mile radius of Panama. The necessity for these orders was shown by the fact that Colombian troops had landed at Colon, where they had threatened a reign of terror and had announced their intention to kill all the American citizens that were there. Captain Hubbard, of the gunboat "Nashville," promptly came to the rescue of our imperiled coun-

trymen and persuaded the troops to re-embark and return peacefully to Colombia.

The people of Panama immediately declared themselves an independent republic with absolute unanimity, and offered to take the treaty which Colombia had refused. We now had two courses open to us: First, to turn against people, our friends, abandon them and allow our foes to reconquer Panama with bloodshed and destruction of property, and allow the anarchy of the past fifty years to continue; second, to let our foes pay the penalty of their folly and stand by our friends, and prevent bloodshed and destruction of property by notifying Colombia that they could not land any troops on the Isthmus. We naturally chose the second course and recognized Panama as a republic. Thus without firing a shot we had prevented a civil war. We promptly negotiated the treaty under which the canal is now being dug. and as a result of our choice Panama has enjoyed a peace and prosperity during the past eight years the like of which had not been known for four centuries.

It can never be said that the United States did not do enough for Colombia, for some time ago Congress agreed to a tri-party agreement between herself, Colombia and Panama, by which, as a simple matter of grace and not of right, adequate and generous compensation was to be given to Colombia for whatever damage she had suffered. However, Colombia refused to agree to this treaty.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## ELECTRIC SIGNS

*A. F. Blake.*

IN these days of mammoth undertakings and colossal enterprises nothing mediocre or commonplace receives the slightest attention. However excellent a thing may be it will fail unless extraordinary measures are taken to divert the attention of the public toward it. We can no longer stand aside and expect others to recognize our merits, but we must display them boldly or go to the wall. This necessity has produced our enormous modern advertising system which finds its culmination in the electric signs of New York City. In these wonderful contrivances with their dancing girls, waving flags and prancing horses, a means has at last been found which, for a time at least, has succeeded in making the busy New Yorker stop to gaze.

It is natural that the value of the electric light for advertising purposes should have been appreciated from the start. It was soon discovered that they could be arranged side by side to form letters and words. This furnished an efficient method of advertising by night. These signs immediately became very common, the novelty wore off, and they no longer attracted particular attention. Next, various little tricks were employed to catch the eye of the passerby. Colors were used, letters were illuminated one by one, little bars of light chased each other around the border. Then figures were formed which could be made to perform simple motions by the automatic lighting and extinguishing of different series of lamps. These devices have become more and more complicated till now we have immense moving pictures in which even changes of facial expression or the waving of a horse's mane are accurately and artistically represented. The

largest and most extraordinary electric signs in the world are displayed on the tops of buildings in the theatre district of New York City. The greatest sign of all these is the one entitled


A NIGHT PHOTOGRAPH SHOWING A GOOD EXAMPLE OF MODERN ELECTRIC SIGNS.
(*Courtesy of Cusack Co.*)

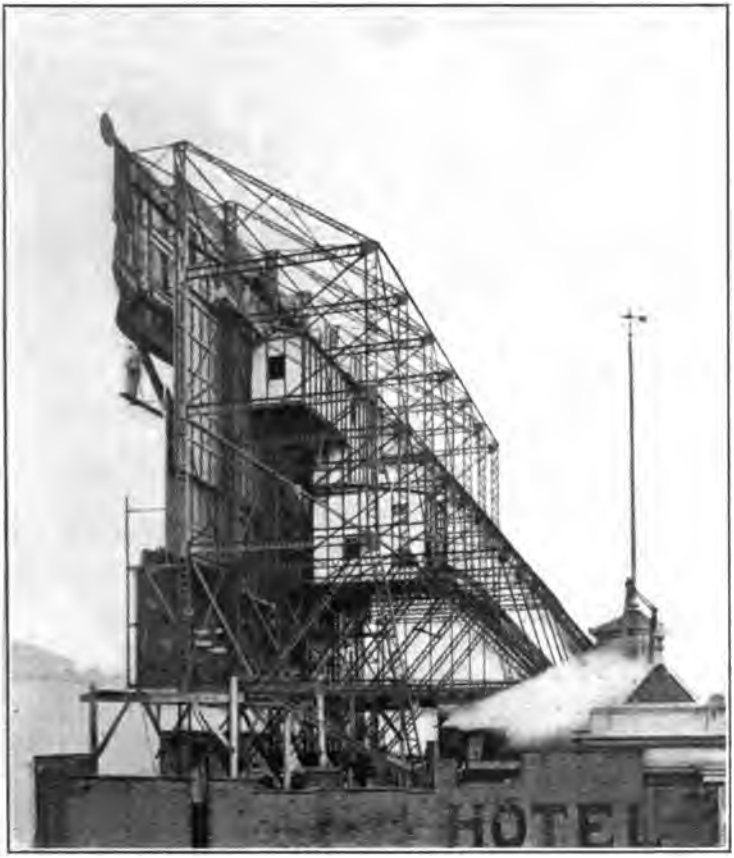
"Leaders of the World," on the Hotel Normandie. By studying this sign we can get some idea of the extent to which this phase of modern advertising is being carried.

This stupendous advertising display is seventy-two feet high and ninety feet wide. The main feature is a realistic representation of a Roman chariot race. The whole effect is produced by the automatic lighting and extinguishing at the proper instant of myriads of little electric bulbs. Two chariots, each drawn by a pair of horses, are racing at full speed around an arena. One of the chariots is considerably in advance of the other. The wheels are revolving so rapidly that the spokes are invisible. The horses' manes are flying in the wind and one can see even the play of their muscles. The driver stands behind in the chariot holding the reins tightly, and seems to be urging his team to greater efforts. His toga is flapping and waving in the breeze. Most extraordinary of all, clouds of dust are rolling up from behind the wheels and the hoofs of the horses. Immediately behind, the second chariot is rounding the curve in hot pursuit. The horses are straining every nerve to overtake the leading team. The spectator, forgetting where he is and what he is looking at, comes to a halt in the busy street below, and eagerly watches to see which chariot will win.

The purpose of the sign is indicated by the title, "Leaders of the World," printed in letters four feet high on a curtain hung over the picture. Underneath are three lines with eighteen characters in a line, on which are flashed in succession the names and products of our leading manufacturing houses. A whole series takes nine minutes, after which the cycle is repeated. The sign is reported to be very successful. It not only attracts and holds the attention of the passerby, but attracts people from a distance who make special trips to see it. Indeed, it is as wonderful a sight as anything we pay to see in a circus.

The mechanism involved is necessarily very complicated. It was only perfected after much ingenious and patient experimenting. The chariots and the bodies of the horses are of course stationary. The illusion of motion is secured by making the road and the wall behind the chariots and all other properties move backwards. The speed conforms exactly to that of the horses legs. These are outlined in eight positions, which are illuminated in succession at such short intervals of time that they appear to move continuously. The remarkable dust cloud effect

is secured by placing rows of electric lights, curved to conform to the dust clouds, behind opulescent glass. These rows are successively flashed, causing the eye to follow the luminous waves which thus appear to be in actual motion. The wall is made to appear curved by reflection.




TREMENDOUS SUPPORTING STRUCTURE OF CHARIOT RACE SIGN IN NEW YORK CITY.
(*Courtesy Scientific American.*)

A few figures will serve to show the magnitude of this clever contrivance. There are in all twenty thousand white and colored lamps, most of which are two candle power. Behind the scenes

there is an apparently hopeless tangle of wire connecting with each lamp. A half a million feet are needed. There are seventy thousand electrical connections and two thousand seven hundred and fifty switches. Six hundred horsepower are required to operate the lights. The details of the mechanism controlling the whole are kept secret, but everything is entirely automatic. A massive steel structure weighing sixty tons supports the sign. Such a strong bracing is not by any means superfluous since the sign presents a large unbroken surface to the wind and the pressure due to this cause is enormous. In a gale the sign must sometimes withstand a pressure of a thousand tons.

This is merely an example of one of the many electric signs which illuminate the streets of our great cties. They are usually neither unattractive nor annoying. Indeed they are often works of art. Moreover, these signs are a public benefit, since they illuminate the streets at no cost to the public. In fact, in some cities there are public thoroughfares which are adequately lighted in this way at private expense.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

*The Hindu-Arabic Numerals.* By David E. Smith and Louis C. Karpinski. Ginn & Co., publishers. $1.25.

To gain some idea of the importance to the modern world of the so-called "Arabic" numerals, one might imagine himself in a situation where it was very necessary, say, to multiply one thousand, two hundred and fifty-seven by one thousand nine hundred and ninety-three; let him now consider what he would do if the simplest form into which he could put the elements of this calculation were: MCCLVII × MCMXCIII. Or let him, to use another example, reflect upon the wracking mental contortions attending the division, according to the Greek numerical system, of a sixth of the alphabet by another fraction thereof. Rather than welter in such a morass, one would hie himself to some secluded spot, remove the impeding vestments, and have recourse to the primitive system of fingers and toes.

We do not readily realize by what arduous and protracted journeyings we have attained unto simplicity. It was thus with the alphabet, and so it is with numeral systems. The authors of the book before us try to tell us, in a simple yet scholarly way, how much we owe to strugglers of the past for the clever and convenient system now available. Much of what is told has been known and written up in its detail here and there in learned periodicals and books, but now we have it all put together and easily accessible.

First of all, the numerals we use are Hindu rather than Arabic in their origin—though we shall probably never know why the signs are exactly what they are. It is not, however, so wonderful to find numerical signs, especially if they have no place-value, that is, no extra signification due to their location with respect to preceding and succeeding signs; many peoples have had these.

Nor was it peculiar to the Hindus or Arabs that they assigned this place-value to their numerals. What "did the business" for the system that has descended to us was, literally, the fact that there was *nothing* in it, *i. e.*, it recognized *zero*. The discovery of a way to indicate the absence of anything at all was what gave the system its incomparable utility. A chapter is devoted to zero by our authors—to the idea of zero, the derivation of the term, and the several ways of signifying it, which was done at first by the use of a dot, then by a cross or circle.

Zero seems to have occurred first in a Hindu inscription of 876 A. D., the earliest Arabic zero dating from 873 A. D. The authors of the book under review regard the claims of Boethius (475-524 A. D.) to have introduced the Hindu-Arabic numerals into Europe as somewhat shaky, though they think it is a wonder that there is no trustworthy evidence for their introduction prior to 1000 A. D. Intercommunication and travel were common enough before that time; nevertheless it appears that the system came to the West only with the rest of the Arab learning. In Germany it is not until 1143 that the earliest traces of computation with Hindu numerals appear, and it was "rather exceptional for the common people of Germany to use the Arabic numerals before the sixteenth century". "Of all the mediæval writers, probably the one most influential in introducing the new numerals to the scholars of Europe was Leonardo Fibonacci, of Pisa", born in 1175.

But the new system did not receive the acclaim which we should expect. "The question is often asked, why did not these new numerals attract more immediate attention? Why did they have to wait until the sixteenth century to be generally used in business and in the schools? In reply it may be said that in their elementary work the schools always wait upon the demands of trade. That work which pretends to touch the life of the people must come reasonably near doing so. Now the computations of business until about 1500 did not demand the new figures, for two reasons: First, cheap paper was not known. Paper-making of any kind was not introduced into Europe until the twelfth century, and cheap paper is a product of the nineteenth. Pencils, too, of the modern type, date only from the sixteenth

century. In the second place, modern methods of operating, particularly of multiplying and dividing (operations of relatively greater importance when all measures were in compound numbers requiring reductions at every step), were not yet invented. The old plan required the erasing of figures after they had served their purpose, an operation very simple with counters, since they could be removed. The new plan did not as easily permit this. Hence we find the new numerals very tardily admitted to the counting-house, and not welcomed with any enthusiasm by teachers" (p. 136).

The reasoning in this book may be a little naïve in spots, but it has many references to scholarly sources, and many apt illustrations in the nature of facsimiles. It clears up a good many points about which a person of inquiring mind is sure to reflect, and forms, in sum, a neat little monograph upon a phase of what the Germans call "Kulturgeschichte", or, in other terminology, of historical anthropology.

ALBERT G. KELLER.

*Yale University.*

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'81—Louis J. Schiller is superintendent of the Warner Sugar Refinery of Edgewater, N. J. His address is 264 Riverside Drive, N. Y.

'01—Ernest M. Baker has become a member of the firm of E. P. Decker & Company, engaged in a general engineering and construction business, with offices at 80 Griswold Street, Detroit, Michigan.

'02—George H. Snowdon has formed the Snowdon-Bidlake Logging Company, with headquarters at 1103 Dominion Trust Building, Vancouver, B. C.

'05—John W. Leavenworth is manager of the hotel department of R. Wallace & Sons, silverware manufacturers, Wallingford, Conn.

'06—Kenneth D. Loose is a foreman on the up-clime with the Loose-Wiles Biscuit Co., Boston, Mass.

'06—E. Bateman is working as a chemist in analyzing and examining forest products for the United States Forestry Service. His address is now, 24 Lathrop Street, Madison, Wis.

'06—H. D. Baker is now with Barrett Manufacturing Co., in Detroit, Mich. He has changed his address to Grosse Point, Farius, Mich.

'07—Walter Walker has charge of the sales department of power apparatus in the Western Electric Co. His address is 520 West 156th Street, New York.

OCTOBER, 1912



# The Yale Scientific Monthly

VOL. XIX No. 2

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

# THE
# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. OCTOBER, 1912. No. 2


FATIMA
TURKISH BLEND CIGARETTES
Cameron & Cameron Co RICHMOND, VA
NO GOLD TIPS BUT FINEST QUALITY
Another Year Ahead of Him
May it be a happy one—may he always have Fatimas.
With each package of Fatimas you get a pennant coupon, 25 of which secure a handsome felt pennant—Colleges, Universities and Fraternal Orders (12x32)—selection of 115
Liggett & Myers Tobacco Co.
20 for 15¢
"Distinctively Individual"

SHEFF RUSH, 1912.

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. OCTOBER, 1912. No. 2

## EDITOR'S NOTES.

### THE UNDERGRADUATE'S OPINION OF POLITICS

OUR country is to-day in the midst of a great political struggle. There are three prominent men who are seeking the highest position in which to represent the people. Two of these men are leading the two old parties; the third is leading a new party. To the undergraduate the platforms of these three parties should be particularly interesting because they deal with the economic and social conditions of the day. These platforms offer the students of economics, the students of government, the students of social science, and the students of history a wonderful opportunity for study.

Every undergraduate has his opinions on politics. He is either for Taft, Wilson, or Roosevelt, unless he be a Socialist or Prohibitionist. The average student's opinion on these big questions is based, not on careful, personal study, but on hearsay or from what he has heard at home. How many of these undergraduates have studied the three platforms, or even know what they are made up of? We will wager that very few of all the undergraduates know thoroughly, and are familiar with, all phrases of more

than one platform. There are many who read only biased newspapers and form their opinion from what they read in these papers. There are still more who judge from personalities and care nothing about the platforms or the parties. There are still others who have for their motto, "Once a Republican, always a Republican". They are called "stand-patters" and are too narrow-minded to see good in any other party.

How superficial and shallow is the average student's knowledge of politics! He will say that he knows as much as the average person and has read as much. True, but does he take into consideration that he is supposed to be an educated man, a man whose mind is broad and who is supposed to have the ability to think and reason for himself? Does he take into consideration that he is here for study; that he doesn't have to support a family or even himself, and therefore, that he has more time to put on these questions than the average man? No, he doesn't take these things into consideration because the average student doesn't THINK.

Our universities to-day, instead of figuring in politics and taking an important and active place in the political ranks, ranks in which all educated and thinking men should be, are unresponsive and unimportant factors politically. This is one of the criticisms of our American colleges and the fault is found in the undergraduate himself; in his attitude toward anything which calls for individual thinking and study.

Surely the average undergraduate here at Yale is capable to think for himself and to study for himself so that, when he talks on politics or anything else he knows what he is talking about and can back up his arguments. What is the purpose of this University? It is to broaden a man and to teach him to think and study for himself. These powers give him the opportunity to educate himself and if he uses them he becomes an educated man.

The average undergraduate ought to be able by this time to use these powers. Then, the welfare of our nation, the thing which should concern us the most deeply, demands us to become interested in the politics of our country, not in a superficial and shallow way, but by serious, individual thinking and study. Our college course is giving us this power. Then let us use it.

## SPIRIT AT GAMES

Frequently—too frequently—as we sit in the stands at a game, we hear some undergraduate severely criticising the team and the coaches. The criticism is for the most part unjustly offered. The men are playing to the best of their ability and the coaches have placed men in positions which they will fill to the best advantage. When a team learns that it is being criticised by the members of the college which it represents, it loses faith in the undergraduates, for it believes that they are not giving it the proper support. Let us do away with this criticising and give all our teams the support that is due them.

* *

## CONCERNING INDUSTRIAL WORK

THE so-called Industrial Work at Sheff last year was a marked success. Over forty men from the various classes entered enthusiastically into the work of teaching groups of foreigners, and besides being a great help to the latter, seem generally to have gained a great deal for themselves from the experience. Classes were held at thirteen distinct points about the city, the subjects taught ranging from English and Civics to such subjects as Mechanical Drawing and Current Topics. A newly acquired stereopticon added to the interest of a number of the gatherings. In fact the difficulty last year seemed to lie more in the direction of a scarcity of places in which to hold classes than in the question of securing undergraduates willing to act as leaders of the classes.

This year, we observe with satisfaction, every effort is being made to increase the scope and efficiency of the work. A splendid coöperation between the city Christian Association and the undergraduate workers has been established, which should certainly aid very materially in opening places in which to carry on the work. The International Secretary of the Industrial Movement has spent several days in the city, making visits in person to various factories and organizations for the express purpose of establishing relations which will make it possible to hold classes

in these places. In this connection we should mention a contemplated progressive step in the work. This is the extending of the work to include classes for American Industrial Workers, in the more theoretical and technical branches of their trade. This seems a little visionary, but the fact that the teaching of a similar group by undergraduates of a New York technical school was successful enough to result in a two dollar increase in the weekly earnings of members of the class, makes us feel that it may well be attempted at Sheff.

As last year, it is planned to hold a meeting every Sunday for those interested in industrial problems, with the specific aim of instructing and helping the leaders of the various classes. Prominent speakers lead these meetings, so that they are both interesting and instructive. Efforts are being made to get the work well under way by the latter part of October. If it was successful last year it should be doubly so this year. When the time comes, we feel confident, that a large number of Sheff men, old and new, will give a due share of their time and attention to this college Industrial Work, which, let us not forget, was founded at Sheff!

* *

## COLLEGE ACTIVITIES

DOUBTLESS the majority of men who enter Yale University hold more or less definite ideas concerning what branches of activities they wish to pursue. The main object of most is to obtain an education in whatever department of the University they enter. Besides this aim nearly every one has or acquires an interest in some outside activity. Of these activities some lead to fame more quickly than others, but the lesser ones deserve as much attention and consideration as the others, for among them may be found the one for which a man is particularly adapted. However, in order to continue in any extra curriculum work, the faculty justly demands that a reasonable grade in scholarship be maintained. Hence, it is clearly the duty of all those who intend entering or have already entered any activity to keep his grades continually above the fatal mark and not to become "dead timber."

## ASSESSMENT FOR THE RUSH

IN order to pay the expenses of the Rush it is necessary to assess members of the Sheff Senior and Junior classes fifty cents. It is essential that each man pay his assessment so that the weight falls evenly upon all. This year the expenses have been cut down as much as possible and the assessment has been made as low as possible upon each man. Last year's assessment was three times that of this year. The committee in charge has unpaid bills for fireworks, torches and the band and it urges every member of the two upper classes to pay up as promptly as they can in order that these bills might be paid. Whether a man attended the Rush or not makes no difference. The assessment is made upon the whole class and each member is supposed to do his share. Collectors have been appointed for each division. The collectors for the Senior class are:

F. S. Meacham, J. W. Martindale, B. Harwood, C. Martin, E. H. Segur, H. G. Foster, J. W. Watzek, J. C. Adriance, J. C. Freeman, J. H. Kelleher, M. C. Dowling, R. Bellows, W. Emery, L. L. Killam, T. M. Prudden.

For the Junior class:

G. B. Jenkinson, C. H. Smith, W. A. Hunter, R. G. Bulkley, M. W. Gane, Jr., C. F. Rufkin, B. H. Bailey, W. S. Bacon, F. D. Armstrong, J. R. Dunlap, J. Hunt, T. G. Vetterlein.

* *

## THE ANNUAL CELEBRATION

THE annual wrestling matches between the Junior and Freshmen classes were held Saturday evening, September 28. The Junior representatives proved the worthy winners, and won two out of three matches, the heavyweight match alone going to the Freshmen. The Seniors gathered in costume at Byers Hall, where their picture was taken. The Juniors and Freshmen also gathered in more or less organized groups. After the picture, the

Senior class, led by a band and followed directly by the Junior and Freshman classes, marched out Hillhouse avenue, over to and out Prospect Street to the wrestling field on Prospect Hill.

The first match was in the lightweight class, which E. O. Hunter won for the Juniors from W. W. Clark, 1915 S. The match terminated at the end of the first bout, when Clark retired on account of an injured finger. N. F. Munger, 1914 S, won from A. C. Mead, 1915 S, in straight falls. This match was the best of the evening, although the match was won in two bouts. In the heavyweight class, E. S. Cushman, 1914 S, was slightly bettered by R. K. Lackey, 1915 S. The Freshman won the first bout, but Cushman was awarded the second bout on decision. When the third bout went to a draw, Lackey received the decision of the match.

The parade then returned to Wall Street, where it disbanded, without the customary rush. Because of the excellent police arrangements there was less of the street fighting which has been such a prominent and disagreeable feature in former celebrations.

* *

## CHANGES IN THE FACULTY

THE YALE SCIENTIFIC MONTHLY extends a cordial welcome to the new members of the faculty of the Sheffield Scientific School and offers congratulations to those who have received advancement.

Dr. Henry W. Foote, former assistant professor of Physical Chemistry, has received a full professorship and thus becomes a member of the Governing Board of the Scientific School. The German department has added to its numbers Dr. August C. Mahr, who recently came to America from Heidelburg University. A Harvard graduate, Dr. Henry Laurens, having completed a biological course in Freiburg, Germany, is teaching in the same here. Mr. D. B. Porghum and Mr. Loomis Havemeyer, both Scientific School graduates, have received appointments. The former will assist in Mechanical Drawing and the latter will teach in the

allied courses of Anthropology and Physical and Commercial Geography. Mr. Clarence E. Clewell, a graduate of the University of Pittsburg, will teach in the Electrical Engineering Department, and Mr. Percy W. Bidwell, an Academic graduate, is an instructor in Economic. Mr. Allan C. Staley will assist as an instructor in the Mechanical Engineering Course, and Mr. Arthur Nabstedt holds a similar position in the Department of Sanitary Engineering. Two graduates of 1912 S, Mr. Frank L. Haigh and Mr. Alexander G. McGaugan, will teach respectively in the Chemistry and Physics Departments.

CAPTAIN WAGNER VAULTING.

Resolution on the death of Harvey Wilmot Black, 1913 S.

Whereas, Almighty God, in His wisdom has deemed it fit to take from us, into His holy keeping, the soul of our beloved friend and classmate, Harvey Wilmot Black; and, whereas, it has been our privilege to have known a man of such strong uprightness and honor; be it

*Resolved,* That we, the Class of 1913 S, tender our most heartfelt sympathy to his family in their bereavement; and be it further

*Resolved,* That these resolutions be sent to his family.

For the Class of 1913 S.

James Tod,
Charles H. Kelley,
James D. Trask,
George D. Macbeth,
Herbert V. Kohler,

REUNION AT COMMENCEMENT, 1912.

## THE PEKIN-KALGAN RAILWAY

BUILT BY JEME TIEN YOW, 1883 S.

*Ira S. Snead.*

THE Pekin-Kalgan Railway is the first railway financed, engineered, and built solely by Chinese. It runs from the capital of the empire to the chief city on the caravan route to Russia. It is already one hundred and thirty miles in length and is being extended. The fact that it was built at a cost without parallel

ENGINEERS WHO BUILT THE RAILROAD; JEME TIEN YOW, THE CHIEF ENGINEER, IN THE CENTER.

*Courtesy Scientific American.*

for similar construction proves the wisdom of the authorities in having absolutely no foreigners connected with the undertaking. Chinese are employed in every department from the lowest coolie or camel driver to the chief engineer himself. It may be of interest to us to know that the chief engineer of this road graduated from the Sheffield Scientific School of Yale

University in 1883. Jeme Tien Yow is now considered the leading engineer of China owing to his personal triumph in the construction of this great railway. He took personal charge of, and succeeded in, an undertaking which foreign engineers declared was absolutely prohibitive to any Chinese engineers and perhaps even to themselves. But in spite of these foreign predictions the Pekin-Kalgan Railway is running at a profit and is earning returns on the money invested.

Preliminary surveys for this line were begun in the summer of 1905, and construction work was begun in October of the same year. In less than one year the first section of the line, thirty-two miles in length, was completed. This section reached to the mouth of the Nankow pass, where extreme difficulties were encountered. As soon as construction was commenced the saving of salaries of various high-priced foreign officials, interpreters, and middle-men, became apparent. The cost of construction itself was lowered owing to the fact that earth work and other construction materials could be procured directly from petty contractors along the line. This saved the expense of commissions on subletting and re-subletting contracts.

The cost of earthworks for the first division of the line averaged two cents per cubic yard, after the Nankow pass was reached its cost rose to three cents per cubic yard because here broken boulders had to be used for embankments. Broken stone for concrete, delivered ready for use, was priced at 13 to 33 cents per cubic yard, and sand for the same purpose was purchased at an average of three cents per cubic yard. Most of the first section of the line consists of flat plain, which slopes gradually to the mountains.

The main railway station is at Tintsin, which is a short distance outside of the great wall of the capital. The station is placed there because of the prejudice of the conservative elements of the people against any desecration, such as a railway entering the walls of the sacred old city.

The first part of section 1 is fertile farming land, which gradually becomes more mountainous as Nankow pass is approached. Here numerous cuts and bridges had to be built,

their construction consisting of steel and concrete. There are in this section twenty-one bridges and seventeen drains, the longest bridge being three hundred feet long. At Nankow, where division number one ends, there are quarters for employees and machine shops, locomotive sheds and other buildings, all admirably constructed.

The next portion of the line to be built was the Nankow pass section, and although it presented many difficulties, and was

A SHORT TUNNEL. NOTE THE PECULIAR RAILROAD SIGNAL POSTS.

*Courtesy Scientific American.*

considered a most difficult piece of railway engineering, Mr. Jeme Tien Yow took up the construction of this section. In spite of the most careful surveys, a zig-zag had to be introduced.. It was introduced not far from the long tunnel at the summit of the mountain where a station was necessary, and the inconvenience was therefor greatly lessened. The railway up Nankow Pass is a succession of cuts, bridges and tunnels.

All the embankments are faced with granite blocks, and all the overhanging boulders have been removed, while those further up have been cemented into place.

In this division there are nineteen bridges and thirty-six culverts, all of steel or concrete. There are four tunnels, which in order of there approach up the mountain are 1,200, 150, 450, and 3,570 feet in length. The first tunnel had to be driven through limestone and took six months to complete; the other three tunnels were driven through granite and were completed in a remarkably short time. The tunnel at the summit, which is the longest in the whole empire of China, took one year to complete, which is a remarkably short period of time considering its length and situation. A shaft was sunk in the center, and with the aid of modern machinery the tunnel was drilled in both directions at once from the center. The tunnel goes beneath the great wall, and the two shafts drilled into it have been relined with stone and are being used as ventilators. All four tunnels are lined with concrete, and the cuts consisted of 640,000 cubic yards, while the embankments required 1,275,000 cubic yards of material. In spite of its magnitude this earthwork labor only cost £44,000. This second division comprises ten miles of the most difficult railway engineering in existence.

The third division is 38 miles long and contains seventeen bridges and thirty-two drains, and was comparatively easy to construct. However there is in this division one bridge 1,000 feet in length, having ten spans each being one hundred feet in length. The fourth division is also 38 miles long, and runs along the Yagho river, where steep embankments were necessary. There are twenty-one bridges and one hundred and thirty drains in this division. On this division there is a coal mine from which the railway gets its supply of coal. This mine has an output of 400 tons per day, and is worked by the company.

The road-bed and rolling stock of the company are exceptionally fine and are destined to give every comfort to travelers. The company is building its own cars, but the locomotives are mostly "Mallet" articulated compound engines, built by the North

British Locomotive Co. The freight cars have a capacity of thirty tons each.

The entire construction of the road went smoothly, there being a total absence of strikes or riots. This is, of course, partly due to the perfect understanding between all classes of laborers, there being no foreign element to cause misunderstanding and disturbance. When the road was complete, the coolies, influenced by the similarity of the railroad tracks to Chinese beds, got in the habit of lying on the tracks with their heads upon the rails. This caused much trouble at first, as the train would have to stop repeatedly to "shoo" off these gentlemen of leisure, but the engineers soon decided that this was too much trouble and many a Chinaman fell into a deeper sleep than he anticipated.

ONE OF THE LONGER BRIDGES. THE PIERS ARE BUILT OF CONCRETE.

*Courtesy Scientific American.*

# THE WORK OF THE JUVENILE COURTS

*E. Carlisle Hunter.*

UNTIL eighteen hundred and ninety-two children were arrested as adult criminals and placed in prisons and penitentiaries with them. In consequence of this, the influence of older criminals was not for the best, and instead of reproving them for what they had done, urged them on to more serious crimes. Then the Juvenile Court was established. It marked a new era in the treatment of our poor children. As Samuel J. Barrows, International Prisoner Commissioner, says: "The establishment of Juvenile Courts is the most notable development in judicial principles of the present country and never before has a judicial reform made such progress." Their idea was to reform, not to convict children. However, these children were not given perfect freedom, but whenever possible are released under the care of probation officers. The probation officer visits him regularly at his home, not only to see that he is carrying out the instructions of the Court and that his home environment is favorable to growth and improvement, but also to try and eliminate unfavorable conditions and bring him into Court again, if he cannot be taken care of properly outside of an institution. If the boy is a member of a street gang or is a resident of a bad neighborhood, the probation officer must report to the Court and the parents are then ordered to move to better surroundings. Judge Richard S. Tuthill, who has presided over the Chicago Court since its establishment has crystallized the spirit of the Juvenile Court principle in a single sentence. "The idea of punishment is eliminated," he says, "and the facts are considered as evidence to show whether the child is a condition of delinquincy, so that the state, standing in loco parentiss, ought to enter upon the exercise of parental care over him."

In Denver the probation system is at its highest point. Here the reform system is used; each boy brought into court is given a card on which is written a number of questions that concern his conduct. This he is required to present at Court every other Saturday morning, after it has been signed and filled out by

his teacher. At these sessions Judge Lindsay mingles among the boys, contrary to the action of the regular Judge. He congratulates and encourages them, treating them squarely.

The Juvenile Court in Denver was founded to punish parents for instructing children in crime and later emerged into a trouble bureau for the youngsters. Physicians attend to bad eyes, good juvenile periodicals replace the cheap dime novels. A rain bath is in use constantly by the juveniles. An outfitting department provides clothes for those that are in need. Thus, the children of Denver are well treated and cared for, better perhaps, than any other children in the country.

Judge Lindsay has made a record which will last long after he is gone. Out of all the hundreds of boys brought before Judge Lindsay, only eighteen have been sent to Industrial Schools. Upon committment, he sends the boys alone and never has one of them run away. In the Denver Court ninety-five per cent of the delinquents have been treated successfully and not one of that five percent is a hopeless case. Opposed to this, up to that time, ninety per cent were convicted and seventy-five per cent of these were sent to jails and reformatories.

The conditions in New York are entirely different. In Denver there are no tenements, but New York is full of them. There are no foreigners in Denver, New York is overcrowded with them. All the conditions in Denver are better than those in New York. Consequently, cases in New York have to be handled accordingly. The Court proceedings are formal, the Judge sitting on the bench in silk robes, the jury sitting on their benches, and the Attorney for the child defendant. The child pleads guilty or not guilty and the case is continued accordingly.

In Chicago, the method used is a mixture between the formality of New York and the informality of Denver.

In closing, a few statistics might not be impertinent. Girls form about one-tenth of the delinquents. Out of five hundred and sixty- eight girls convicted in 1914, four hundred and twenty-six were cases of improper guardianship . Only twenty-three girls convicted for larcency against five hundred and forty-eight boys. These figures speak louder than words. The Juvenile Court is a great institution and its work and progress has been marvellous.

# SOCCER, THE COMING GAME

*Clyde Martin.*

TO even the casual observer it is evident that among the universities, colleges, and schools there is a growing demand for sport and pastimes that will interest the many rather than the specialized few. The up-to-date physical instrcutor is seeking the things that tend to develop normally healthy human beings rather than those that produce athletic marvels. It is a case of pleasurable pastime vs. strenuous endeavor and while the honor of making the varsity team will be just as great in the future as in the past, the average student will be given a wider range for his athletic proclivities.

Among the sports finding favor with the athletic officials is soccer or association football, which of late years has been slowly but surely increasing in popularity. The game was given quite a boost at the recent meeting of the National Intercollegiate Association at New York, when a committee was appointed to take charge of and regulate it. For several years Yale, Harvard, Princeton, Pennsylvania, Haverford and other institutions have competed in a league and it has been played in a somewhat desultory fashion at Illinois, Chicago, Indiana, and other western Universities. The endorsement given the game by the N. I. A. undoubtedly will help it along.

Without wishing to disparage intercollegiate football one whit it is evident that in its present form it will never amount to anything outside of the Universities and schools. During the last twenty years it has been tried by the big athletic clubs of the country, and teams of university stars have been organized and the game has been played semi-professionally in many cities. Today this class of football is practically dead, even deader than horse racing.

Soccer, on the other hand, has had its greatest growth outside the colleges and those who follow it closely are bold enough to predict that some day it will eclipse the intercollegiate game here as it did the rugby game in Great Britain. To the doubt-

ing Thomases the prophets reply, "See what the onced scoffed at game of golf has grown to."

When the soccer code was introduced into Great Britain it was rated with the meek and lowly sports, but at the present time the Football Association has jurisdiction over 14,000 clubs and on its rolls are 750,000 members. These figures do not include the thousands of players in the schools.

The American takes his sport strenuously and the question naturally arises: "Will soccer football satisfy him?" This already has been answered by the success attained by the game at St. Louis, where the sport attracts big crowds and where the St. Leo team, one of the best in the country, is composed almost exclusively of American born players. High class teams of home bred players can be found at Coal City, Ill., Fall River, Mass., and a number of other cities.

The most promising sign, however, is the adoption of the sport by the schoolboys of Brooklyn, Baltimore, St. Louis, Chicago, and other football centers, for from these youngsters will come the players who some day will have to represent this country in its international fixtures.

To the uninitiated it may be well to explain that the game is played with a round ball, eleven men competing on each team. The ground averages 120 yards in length and 75 yards in width, the goals being 24 feet wide, with the cross bar 8 feet from the ground. The object of the teams is to kick the ball through the goal, not over it, as in the intercollegiate game. The only point that counts is a goal. Only the goal keeper can handle the ball, the other players having to depend on their feet and heads, the latter being used to butt the ball back or pass it to a team mate.

To the stranger the science of the game is not at first evident, but on closer acquaintance he will find that it calls for great skill. It takes a boy from eight to ten years to develop into a capable performer, and in the professional ranks in England the star players are just as prominent as the star men in baseball here.

It is a sport that the business young man can play once a week without special training, and already in the East it is being played by members of the leading clubs. In Philadelphia all of the

cricket clubs have elevens, while in Brooklyn the Crescent Athletic Club has a strong team.

In Chicago soccer has been started in the small south side parks and quite recently the Sherman Park 105-pound team won the championship by defeating the Palmer eleven of Pullman.

Much more could be written as to the merits of the game, but its great charm lies in the fact that it furnishes healthy exercise, is a game of great skill and free from really dangerous accidents. It should be an ideal sport for the big clubs and in future years there doubtless will be teams composed of former collegians who will play the game for years after leaving college, as is the case in Great Britain and other European countries.


NORTHFIELD CONFERENCE.

# GERMAN AND AMERICAN UNIVERSITIES

*Professor Paul Zeitmann, (the Prussian Exchange Professor).*

ONE material difference between the American and the German University appears from the fact that a Yale student who wants to matriculate as a regular student at a German University must have finished his undergraduate course; must have his B. A. The German University is not connected with a college, neither have we separate colleges that do undergraduate work only. High school and college, at least the first three years of college work, and even part of the elementary school—to express it in American terms—are combined and form one institution, called a higher school (of which there are three different types). So the University comprises practically only graduate departments.

Another difference is indicated by the fact that there are no entrance examinations at our Universities—though entrance requirements are exacted. Whoever wishes to enter the University as a regular student and intends to pass the examination at the end of the course must have successfully completed the course of a higher school. The certificates which those schools (all of them are supervised by the state, and are public schools) issue, admit to the University, and there is no other way of being admitted, at least as a regular student. The American B. A. is considered equivalent to this certificate; but as the amount of work required from the German boy in school is heavier, he is generally younger when he gets this leaving certificate mentioned above than the American student is when he gets his B. A. —19.6 or 19.8 years is the average age at entering the University. So, as to age of the student, the German University corresponds partly to the American college, in the character of its work it almost entirely corresponds to the Senior year and Graduate departments here.

The curriculum—if this term may be applied to our Universities—is absolutely elective in most of the departments. It is a little restricted in others, as, for instance, in medicine and law. But it may be safely said that any student is permitted to attend any course that he may like to(provided he pay for it, the fee

being about \$5 a semester, that is \$10 a year, for a course of three or four lectures a week, and \$2.50, or \$5 a year, for a course of two lectures a week; there are also many courses free of charge or public).

The attendance at the lectures (there are no recitations) is elective as the course of study; the student may attend them, or he may stay out altogether and make one or two hundred cuts a semester, nobody cares, if he himself doesn't. It is the same with his home work; whether he studies or not, nobody cares and nobody will exercise any supervision or control over his work. There are no examinations at the end of the year or semester or course, no home work is assigned to the students, in fact, it is absolutely left to the individual student whether he will study or not, or what kind of work he will take up. When I described this system to a Yale student, he said: "Oh, that would be capital here"—but he became rather doubtful when I went on. Examinations are held only at the end of the whole course, and it is also entirely up to the student, when he wants to take them. He has to study at the University at least three years before he is admitted to the examinations, but only very few study for so short a time; four or five years are frequent, six and seven are not at all uncommon. The examinations are of two kinds; either a University examination, by which the degree of doctor is acquired, but this degree does not carry any important rights or privileges with it; or a state examination,— this the great majority of the students pass—or try to pass. Whoever wants to be admitted to the professions, or to any higher calling, or to the higher positions in the civil service, has to pass a severe state examination; no matter whether he intends to become a physician or a clergyman, a teacher or a judge or lawyer, an architect or mining engineer. And as practically all of these positions (of course that of doctor or lawyer excepted) are government positions, for a life-time and carry with them the right of pension for the office-holder and to a certain degree also for his widow and his children (up to a certain age) in case he dies,—as all these important rights go with the positions and are acquired by them it will easily be seen that most of the students pass these final examinations,

the most important check to the academic liberty described above.

The same liberty that the student enjoys in his studies, he enjoys in his life. There are no dormitories provided by the University, nor are there any private dormitories, no dining halls, no clubs or similar rooms, with the occasional exception of a reading room. There is hardly anything of what is called "college life" in America. The student goes to his room somewhere in town; he takes his meals at some restaurant. There are no athletic or social, and barely any "events", no Prom., no "Fan", and no Glee Club Concert. In fact, there is no college spirit, hardly any common feeling at all at our University, only a certain local spirit, which is particularly strong at some of the smaller Universities in South Germany. This local spirit, the strong personal influence of some professor, and frequently the fraternity, are the bonds that connect the German student with his alma mater—or rather almae matres, for the large majority of the students go to different Universities, just like the student of the Middle Ages. In the fraternities, called "Korporations" or "Verbindungen", much of what is called college life is to be found, but confined to small groups of students only, which are frequently antagonistic to one another. The members of many of them "wear colours" as we say, viz., they have caps and ribbons of certain colours; one fraternity, for instance, wears dark blue caps, the other red ones, and a third one white ones, etc. But there are many that do not wear caps and ribbons. The fraternity life centers around the "Kneipe", that is, the solemn social gathering of all the members around the drinking table, held sometimes at a restaurant, sometimes at the fraternity house. Picturesque customs and even a certain code of law, or rather, "rules of order", have been developed, in order to keep up discipline at the table—which is sometimes not an easy job for the chairman. Many of the fraternities are what we call "fighting, or rather fencing corporations". That is to say, nobody can become a full member of the society before he has fought a certain number of duels—whether successfully or unsuccessfully does not make any difference. But these are not actual duels. Two fraternities who

are on friendly terms agree that their new members shall fence against one another. If the young member happens to get a regular little duel, it also counts. This fencing is not dangerous, and though generally not without the loss of blood, I think that it is less dangerous than football, the student being so well patched up and armoured—not with steel plates but with cotton wool—that only the skull and cheeks can be hit. Regular sabre-drills happen sometimes and are of course more dangerous. The value of the fencing consists in that it obliges a young man to develop strength and skill and especially courage, and that it is a certain means of self-discipline of the student body. The American student who goes to a German University need not be afraid of a duel, as nobody who shows ordinary good behavior is likely to get into that trouble. But, of course, if he stays out very late at night, and is too much tempted by our good Munich beer and then meets other fellows who also have not been able to resist the same temptation, who have looked into their glass too deeply as we say, why then nobody knows what is going to happen.

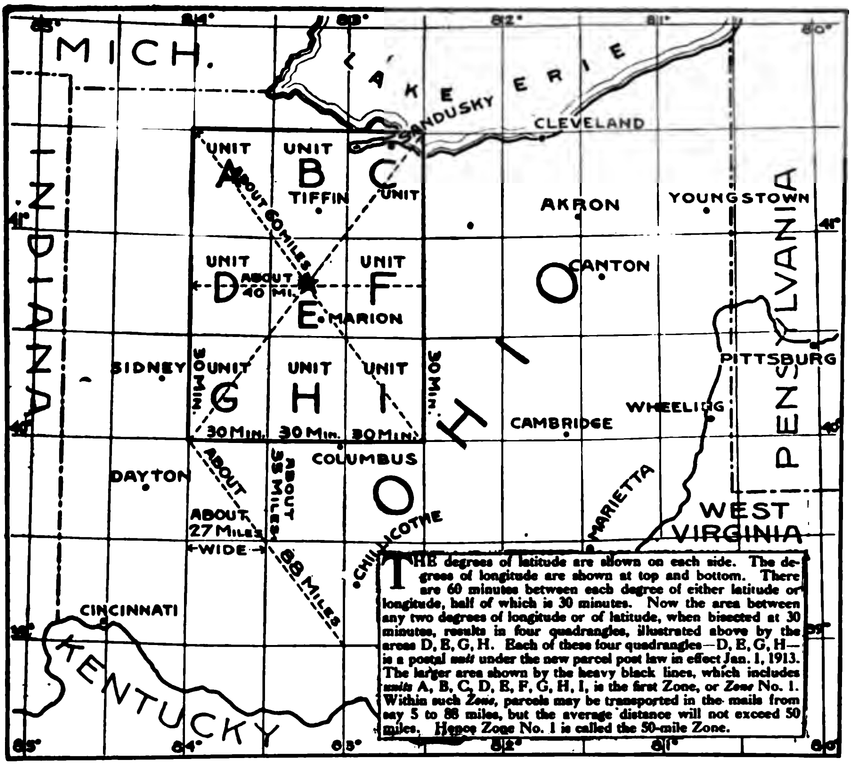
I will not enter a discussion of the comparative value of the two systems; there is much to be said on either side, and after all, I think that each country has what it wants and what it can have under the present circumstances. I will only add one remark. I have frequently been asked by Yale students how expensive life in Germany is for an American student. Perhaps an estimate of the cost of living will therefore not be without interest. I will make out two, one for a young man with medium means, who goes over there to study; the other one for a man who can spend more freely and who wants to see German life and have a good time.

| | 1st Case. | 2d Case. |
|---|---|---|
| Room and breakfast per month........ | 40 M | 65 M |
| Dinner 1.50 M per day, per month...... | 45 M | 60 M |
| Supper 1.20 M per day, per month...... | 36 M | 50 M |
| Tuition about 300 M per year, per month | 30 M | 20 M |
| Sundries, per month.................. | 49 M | 105 M |
| Per month ...................... | 200 M | 300 M |

In American money, total would be \$50 and \$75 respectively per month, or \$600 and \$900 per year. Of course, it is possible to spend a few hundred dollars a month, but on the sums mentioned a foreigner can live easily and comfortably, many German students living on \$30 a month or even less.

I am sure that any American student who will come to our Universities will enjoy it, and will get something out of it. Of course, the more German he knows the better, but I should not advise anybody to go over there without having a good reading knowledge of German, then he will soon learn to write distinctly and to speak the language.

# Parcel Post Zones Made Plain




Scale of Map, 63 Miles to One Inch. Courtesy of Farm and Home, Chicago, Ill., and Springfield, Mass.

# PARCEL POST

*A. F. Blake.*

AT last we have a parcel post. Congress has finally granted the public demand and the new system goes into effect Jan. 1, 1913. No longer will we have to pay sixty-four cents to send a four pound package from New York to Jersey City when an Englishman can send an eleven pound package from one end of the kingdom to the other for only twenty cents. No longer will we have to pay whatever exorbitant price the express company chooses to charge for the transportation of a parcel weighing more than four pounds. Everyone has always known that a parcel post would benefit the public and the newspapers and magazines have been agitating the subject for thirty years. As Mr. Wanamaker, former Postmaster General once said, "There are four reasons why it has not come before; namely: Adams Express Co., American Express Co., United States Express Co., and Wells, Fargo Express Co". At last, however, the United States falls in line with practically all the other civilized countries and we are to have a parcel post.

Nobody seems to understand parcel post. Everybody wants to know about it. In the first place, packages of any weight up to eleven pounds may be sent through the mail. The present limit is four pounds. The government has fixed the charge on each package so that it equals, as far as practicable, the actual cost of transportation. The amount of postage, therefore, must depend partly upon the weight, and partly upon the distance. Some method of fixing the charge according to distance had to be devised which should be simple enough for actual practice and yet fair to everyone. The plan which has been adopted seems at first a little complicated but a brief consideration of it shows that it is the simplest plan possible which can fulfill the necessary requirements.

The most obvious plan would be to take each post-office as a center and draw circles around it according to the zone dis-

tances agreed upon. But as there are some 60,000 post-offices in the United States, an effort to designate each one, even on a map ten feet square, would be like printing the Lord's Prayer on the head of a pin. Each state might be taken as a unit, but on account of the vast differences in the sizes of the state and the great variation in the density of their populations this plan would certainly be unfair and so was abandoned. Using each county as a unit was also considered, but this plan was open to the same objections. Furthermore, both state and county boundary lines might eventually change. This then brings us to the adoption of a unit consisting of a quadrangle formed by meridians of the longitude and parallels of latitude. These units are practically uniform in size and their boundries are forever fixed. There is just one difficulty here. A person near a boundary line would have to pay an increased rate for only a mile or two if the addressee's post-office were just over the line. Under other circumstances one could send a package eighty miles at the minmum rate. This was recognized as unscientific and inequitable and has been avoided in the plan which has been adopted.

According to this system the country is to be divided by the meridians of longitude and the parallels of latitude into quadrangles of thirty minutes in each dimension. The chart of Ohio is shown here thus divided. Each quadrangle, as the one marked E, is a parcel post unit. The area included the first zone, or zone No. 1, reckoned from the unit E as the starting point of the zone is shown by the heavy black lines which from the border inclosing the units A, B, C, D, E, F, G, H, and I.

Now suppose that you lived within the territory served by the Marion Post Office, shown in the lower right hand corner of unit E. By LOCAL parcel post you can mail to any part of the territory served by the Marion Post Office, or receive from any part thereof, taken or delivered at your door, parcels on which the postage is five cents for the first pound and one cent for each additional pound up to a total of not exceeding eleven pounds.

Also you can mail by parcel post a packet from your house to any other post-office in any of the contiguous units (A, B, C, D,

E, F, G, H, I) which comprise your first zone, at the first zone rate of five cents for the first pound and three cents for each additional pound. Your first ZONE always consists of nine UNITS, wherever you may live, says FARM and HOME.

Your SECOND ZONE is any post-office in any unit outside of your first zone but not further than 150 miles from the center of your own postal unit, which is unit E, and so on for the third to eighth zones. Observe that in measuring for the second zone you measure from the center of your unit E, shown by the star, and not from your post-office.

This same explanation applies to every parcel post in the United States. Each unit is forever fixed, but the zones are measured from any unit. The units vary somewhat in size because of the earth's curvature. Between latitudes 40 and 41 degrees the unit is about 27 miles wide by about 35 miles high or long.

It is easy for anyone to compute parcel post for himself. Get a map which shows each parallel of latitude and each meridian of longitude. Draw across these lines with pencil or ink so as to bring them out boldly. You see at once that this divides the country into large quadrangles bounded by said lines. Now draw another line through the center of each of the quadrangles, and you split each quadrangle into "a quarter of the area formed by the intersecting parallels of latitude and the meridians of longitude," as the new law specifies, same as above chart shows for Ohio. You will then see at a glance in which unit your post-office is located. Knowing this fact and observing the scales of miles to the inch on your map, you can tell by measuring on the map in what zone any other post-office is located. The Postal Department is preparing indexes and maps to show at a glance all such facts. The Express Companies are adopting similar methods of computing distances.

A comparison between the present rates and those which will be charged under the new parcel post system shows that there will be a heavy reduction in the cost of transporting packages. This is clearly shown in the accompanying table. Add to this the fact that we can send packages by post which formerly had

to go by express and we realize that the new system is bound to introduce new conditions which will have far reaching consequences. Several important respects in which the parcel post is expected to benefit the country are enumerated below:

1. Farmers will sell produce direct to the consumers, mailing it fresh from the farm daily, or as often as necessary. This is going to benefit both producers and consumers, affording the farmer a better market and better profits, while giving consumers better food at lower prices than they now pay their retail store.

2. The transportation of small packages within the territory of each local post-office, in the country or city, will be done mainly by parcel post. This will prove a great convience to the public, and will promote the buisness of local merchants a and retailers.

3. The country store will undergo great changes. Their slipshod, careless ways of doing buisness must give way to the new, progressive, up to date methods essential to make the country store the center of a more perfect distribution for what the people require.

4. Post roads are to be greatly improved. Good roads will gradually become the rule instead of the exception. This will vastly benefit all rural property, stimulate better farming, increase production, reduce expense of transportation, and thus tend to keep down the increasing cost of living.

5. The motor post coach is bound to come throughout the United States. It is already common in some parts of Eroupe. Here it will collect and carry parcels, passengers and mail. It will supply to rural towns rapid transit comparable to the transit supplied to cities by electric street railways.

6. Buisness by post is to witness a well-nigh inmeasurable expansion. In due time the law will provide for collection on delivery of parcel, insurance, and other conviences.

7. A universal system must be provided for postal currency, also postal checks which can be drawn for any amount and collected without expense, thus increasing profoundly the convenience for the exchange of values and products.

8. Eventually the post-office department will take over the express companies. The railroads will continue to be owned as at present, but under a more perfect supervision, which will make their buisness safer and profitable and more greatly convenience the whole public.

9. These and other changes will so prove rural life as to attract people from city to country, thus profoundly improving social conditions, while promoting economic prosperity.

# INDUSTRIAL ACCIDENTS AND THEIR PREVENTION

*F. W. Schmidt.*

ACCIDENTS are bound to happen. In every industrial plant where power is used there is present great dynamic power which is so much greater than the possible resistance of the strongest human body, that the man exposed to a blow from it gets the worst of it. It is obvious that the starting point of all accidents is the power. If there is no power in a plant, there will be no accident. The German maxim "Show me a man who never made any mistakes, and I will show you a man who never did anything", has its parallel in the industrial world—"show me the works in which there are no industrial accidents and I will show you works in which they nowhere turn a wheel."

When an employee of a factory sustains an accident, the results of that accident do not confine themselves to the condition in which it leaves that man. It may leave him incapable of doing his former work or working up to his former capacity. It may take all his savings and "rainy day" money for doctor's bills. It may impoverish his family or make him a cripple for life. But it also effects the employer, in that he is liable to a damage suit. He loses in the output of the department wherein the man was employed. If the employee is unable to do his former work a new man must be found for the job and very likely will have to be trained. This all takes time and decreases output. There also enters into the question the moral effect that an accident has on a room of operators. Should blood be shed it is likely that the employees would be working the rest of the day at a much lower efficiency and this all counts in the total output.

Although it is plainly evident that accidents are costly to all concerned, this country has lagged far behind Germany, Great Britain, and France in the study and legislation of this matter. These countries for more than thirty years have been enforcing with strictness and excellent technical judgement the existing

laws for safeguarding industrial workers. Interest in the educational and sentimental aspects of accident prevention is being aroused to some extent in the East by the efforts of the American Museum of Safety Devices, and the National Association of Manufacturers.

Industrial accident reporting is still very incomplete in the United States, yet we can gain some idea of the terrible toll of like taken each year by our manufacturing enterprises. Bulletin No. 78, of the Bureau of Labor, September, 1908, states that, among adult wage earners alone, the yearly mortality from accidents is between 30,000 and 35,000. The non-fatal injuries inflicted have been estimated at no less than 2,000,000, additional. These figures when compared with the more thorough foreign accident returns give us just cause to inquire why we should be so far behind in conserving the lives and health of the industrial workers.

From the way legislative acts, laws etc., fail to bring about conditions of safety, those knowing the conditions have come to the conclusion that the way to bring about a new era is to train the young mechanical engineer so that he comes to realize the risks involved in the use of power. The progress of the art of preventing industrial accident, wherever practicable depends in a large measure upon the interest shown in the subject by members of the profession.

In the short space allowed this paper, we can only deal very lightly with the work that the mechanical engineer may achieve in the conservation movement. An accident as the term is used in this paper, may be defined as any unforseen and usually sudden occurence which results in bodily injury to any person while present at the work-place or even within the boundaries of the employer's premises.

An elaborate study, covering thousands of cases, of indusrial accidents, made by John Calder, show the following to be the chief causes, ignorance, carelessness, unsuitable clothing, insufficient lighting, dirty and obstructed work places, defects of machinery and structures, and absence of safeguards.

Insufficient lighting has been found to be a cause of numerous accidents, particularly serious and fatal falls. Mr. Calder has compiled statistics showing that a maximum of accidents occur towards the close and beginning of each year, that is during November, December and January, the months of minimum daylight. Fig. A shows the seasonal distribution

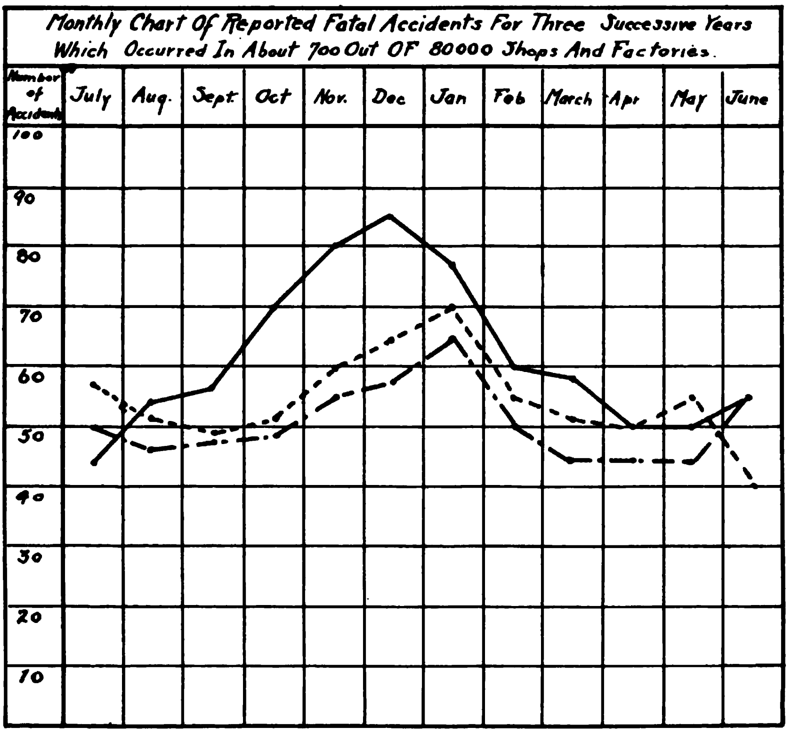



FIG. A.

for three successive years of about 700 deaths annually from industrial accidents which were reported with other injuries from an area embracing 80,000 plants of varying extents.

Already much has been done, by the toolbuilders, by useful safeguarding, particularly in protecting the workman from the dangers of tooth gears in metal working and other tools. Once

in a while we find a case of gear guarding which is worse than useless. An example of this is the case shown in Fig. 1, where the pinions are securely covered on the top, which is the outrunning and safe side, by semicircular flanged hoods, whereas the intaking and dangerous parts of the gears are unprotected and may grip the clothes and limbs of unsuspecting operatives. Fig. 2 shows the proper gear protection. Cases like these show that as yet the designer looks more toward the appearance of the guards than the utility, though well designed and neatly applied guards are seldom prominent features on machines.

It is only possible in a short paper to take up a few of the examples of safeguarding now practiced, but what is shown here applies as well to all forms of power-driven machinery.

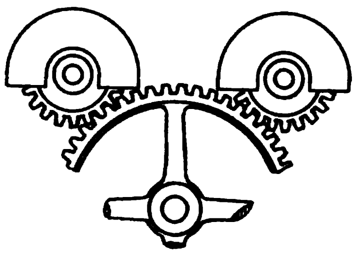


Fig. 1.

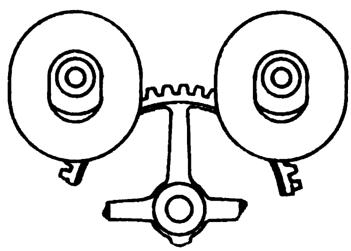


Fig. 2.

Let us take up first the consideration of guarding equipment built in position, such as power generators and a large class of machines whose accident risks at dangerous parts depend on the manner of the installation and the nature of the workman's duty around them. In such cases as steam turbines and high speed engines, railings are used and rotating parts enclosed as far as possible. Floors are usually slippery around engines and a mesh surrounding the governor balls of an engine may save a workman from fatal injury should he slip while oiling or cleaning the engine.

The next point to consider is the safety of the connecting links between the power house or the shop motors and the individual machine tools and apparatus. Transmission machinery, whatever its situation in relation to the floor level, has its acci-

dent risk, conditioned by the necessity for any workman having to touch or approach it in motion in the course of his duties.

The newer improvements in transmission, brought about by the individual and multiplied motor drives, have helped much to make conditions better. The motor drive can be screened off or placed at an elevation and has done away with transmission belts, shafts, pulleys, collars and couplings where they were near the employees.

Fig. 3 shows a metal tube for rotary shafts that must be approached closely while in motion, and Fig. 4 shows a form of protection for transmission in old plants with insufficient head room.

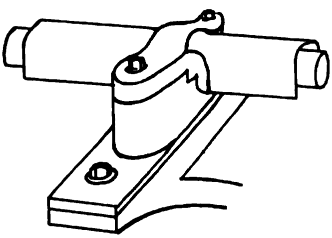


FIG. 3.

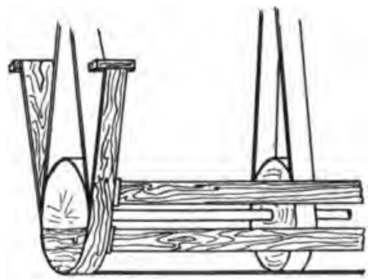


FIG. 4.

The most difficult safeguarding problems for the engineer are those relating to numerous machines used in the arts, which after the maker and installer have carefully protected all the details, are essentially dangerous at the operating point, if worked at all. A universal guard is useless in most cases because of the variety of uses to which such apparatus is put. There are protections on the market however which are claimed to be of all round use.

No machine, can be called effectively protected by any guard which hampers a workman and reduces his speed and earnings. Such apparatus is naturally removed by the workman or wholly or partly put out of action at the first opportunity. In order to illustrate the problem of the especially dangerous machine we will discuss as examples, four of those most liable to cause accident to the operator when performing his usual duties. These

four are; wood-working saws, punches and presses, rolling machinery of all kinds where hand feeding is necessary, and emery and other grinding wheels.

It is necessary in the operation of sharp cutting tools running at high speed, for the operator to have his fingers close to the cutting edge. An efficient and safe saw guard is one which will fulfill all or any of the following conditions:

1. The safeguarding must be strongly made and once adjusted must be able to retain its position and form without special care on the part of the saw operator.

2. It must so protect the saw, both above and below the bench and before and behind the saw that no one can accidentally touch or fall on the saw.

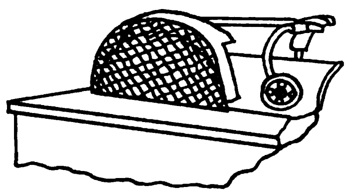


FIG. 5.

3. It must not permit the work in a ripping saw to close upon the blade, mount the same or be projected to the danger of those around.

4. It must not obscure the workman's vision of the line of the saw.

5. It must be especially adapted to the class of work done on the saw bench and where required, it must leave all of the area of the saw table clear of obstruction and also the space above the guard itself, Fig. 5, shows one of the ways in which a guard, meeting these conditions, has been designed.

Next to wood-working tools in frequency of accident, come punch and press machinery, though the resulting injuries are not usually as serious as is the case in the former machines. Care should be taken with these machines to see that they are in good repair, particularly the actuating gears. Many of the dangers have been eliminated by using automatic roll-feeds, subpresses, magazines, hopper, gravity slides and push slide feeds,

Compressed air is used to blow the light pieces off the dies at the end of the operation while the heavy pieces are removed by spring ejectors. These do away with the necessity of the operator having his hands under the press. In the ordinary press where the operator feeds a long ribbon of metal under a punch, which stamps forms out of the metal, the movements of the operator become automatic and have a certain rythm. He knows the sound of the machine so that he can tell when the punch is about to descend and he gets his fingers out of the way with very little time to spare. Should a loud noise be made in the room or any other disturbance such as would attract his atten-

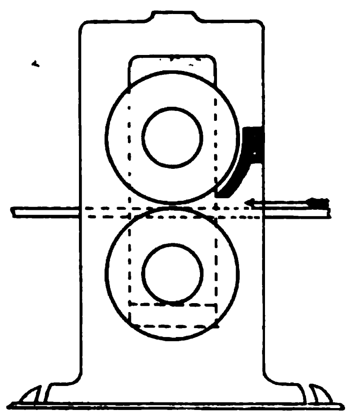


FIG. 6.

tion occur, his mind is momentarily taken from his work, he loses the rythm, and unless he is very fortunate his fingers are caught. The arrangements devised to prevent such occurrences are usually bars which are set to descend just ahead of the punch so that while not inflicting injury as would the tool, yet they warn the operator so that he quickly takes his hands out of danger.

The third class of dangerous machines, dangerous at the operating point, includes hand-fed rolling machinery of every description. At powerful hand-fed pressing and calendering rolls the injuries are usually very severe. In the case of a single pair of large rolls such as are used for paper glazing, Fig. 6, comparatively thin sheets of material are fed in and it is possible by having

the feed table level with the top of the lower roll and placing a bar, plate or screen across the bottom of the upper roll, to guard effectively the dangerous intake, by arresting the operator's hand when accidentally traveling towards it on the work. Hinged guards, preferably of mesh work, may be used where the intake of the rolls must be visible at all times and instantly accesible. The fixed forms of roll guards, however, wherever possible, are the safest. It has been found in practice that the use of a feeding table which keeps the operator at a safe minimum distance from the roll intake and necessitates a conscious effort to reach it, reduces the chance of accident from hand-fed vertical rolls.

In laundry and cloth finishing machinery these forms of guards are not practicable on the rolls, owing to the nature of the work. In such cases a light, smooth auxiliary hardwood roll is substituted as a guard. Springs keep it continually pressed against the main rolls, by which it is driven, but it fills the dangerous intake and arrests any part of the hand accidentally traveling into the rolls.

The fourth class of dangerous tools that we are discussing includes emery wheels, grindstones and other abrasive tools. All of these when over-speeded, strained or shocked while in motion, sometimes burst violently and cause the death of those within reach of the flying parts. These tools have been rendered safe as far as possible by providing hoods capable of restraining the fragments and by improving the mounting of the wheels to avoid initial stresses and to restrain fragments flying from the center because of fracture.

What we have seen done to these four classes of machines can be done, in some modified form, to all machines using power. This question of the conservation of human life by protecting operators from dangers which lurk in every machine is a question which is becoming more acute every day and which must be met with in the next generation. Not only is it a question of improving the design of the machines and of educating the engineer, but it is a question of educating the operator so that he realizes the importance of the safeguards being applied for his benefit. Such an education of necessity must proceed slowly, and whatever improvements come about will come slowly in the natural evolution of things.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## SMOKE AND FUME PREVENTION BY ELECTRICITY

*A. B. Reeve.*

ONE has only to consider for a moment the immensity of the problem of smoke and fume prevention in the present industrial age to realize the great importance of, and interest connected with, the recent successful application of electricity for this purpose. Everywhere one looks there rises chimneys or stacks, the inevitable sign of our industrial activities, each pouring forth its volume of smoke or fume and adding its quota of polution to the pure air. This smoke and fume problem is one of the serious problems of our great cities, not only from a board of health point of view, but also from the point of view of the material loss it represents. Even a step in the direction of the prevention of such a nuisance is of the utmost importance, and it is a very successful step of this kind that we wish to describe. However it should be understood that the system under discussion, which is technically known as the "electric precipitation of suspended particles", is at present applicable only to the ***suspended*** particles in the waste gases, and has thus far found especial use not so much in the mitigating of the smoke nuisance, as in the reducing of the obnoxious gases which are the result of smelting and similar industrial processes.

This principle of the electric precipitation of suspended particles is by no means new. It is the new and practical application of an old principle to a very vital problem of the day which has aroused such interest within the past few years. Early experiments along this line were even carried out by Sir Oliver Lodge about the year 1884, although the possibilities of such a use of electricity had been suggested sixty years before this. The

results of the early experiments, however, were at that time disappointing owing, probably, for the most part to the inadequate source of current, as Wimshurst machines were the only things at hand.

The question arises just what is this principle of electric precipitation. There are in the first place two entirely distinct ways in which we may use electricity for precipitating floating particles. The first way is by the use of alternating current of high potential which, charging the floating particles between the suitable electrodes furnished, both positively and negatively, cause them to attract each other and unite forming larger particles which settle

1. CURRENT ON. 2. CURRENT OFF.

or precipitate rapidly due to gravitation. This can be done in the case of a mist or fog as may easily be demonstrated by the proper apparatus in the laboratory, but in the case of swiftly ascending flue fumes the aggregation or combining process is quite insufficient. The problem of the precipitation of the rapidly moving particles met with in this case requires the second method, the employment of direct current. It is an old principle of Physics that if a needle point be highly charged with electricity of one sign, and a flat plate be brought near it oppositely charged, the

particles between the two will receive the same charge as the needle point and will thus be rapidly attracted to the plate. This is the old experiment of the "electric whirl" or the blowing out of a candle by the electric "wind" from a charged point. Thus in the case of smelter fumes passing between a series of such points and plates, the particles of the fumes are drawn to the plates, to which they adhere instead of passing to the external air by way of the flue.

The principle is simple but its practical application to the actual conditons of commercal operaton has only recently been accomplished with success by Professor F. G. Cottrell of the University of California and his fellow workers, who have solved the many difficult problems which presented themselves, with no little ingenuity. It is, moreover, to Professor Cottrell's recent publication of an account of his experiments and work that we owe much of our information on this subject.

It is of interest to note that an accidental discovery, as has so often been the case, opened the way to much of the success obtained. The question of suitable sharp pointed electrodes which would withstand the severity of actual operating conditions in a flue was at first a puzzling one. Ordinary needle points served well enough for laboratory experimenting, but when the number was greatly multiplied the difficulty of securing an evenly distributed charge over the whole number was almost insurmountable, and the sharp points would last but a short time in the acid atmosphere to which they would, of necessity, be subjected in certain flues. However, by accident it was noticed, during one experiment, that a piece of cotton covered wire used to conduct the high potential current used, showed over its complete surface a uniform purple glow, and the idea suggested itself that here was the material to use for obtaining the desired even distribution of current! It seems that the cotton covering of the wire, kept damp by the ordinary dampness of the air, was a sufficiently good conductor to allow of an electric discharge, and that the fine cotton fibres furnished, in a wonderfully easy manner, the desired system of sharp discharge points. In practice an equally effective substance and a more durable one has been found in a combination of asbestos and mica, which also supplies the necessary points of

extreme fineness. This material is twisted up with wire, and this wire forms one electrode of the high potential direct current used for precipitation, while lead or iron plates are used for the other electrode. Since anywhere from about 4,000 to 30,000 volts are required for precipitation, it is found convenient to use an alternating current transformer with which to get this high potential, and there to employ a rotary transformer to change this alternating current into a direct current, of necessity intermittent, but serving the purpose nevertheless.

4. CURRENT ON.

5. CURRENT OFF.

It appears that the first experiments on electric precipitation carried out on a commercial scale, were made at the Hercules Works of the DuPont Powder Company on the sulphuric acid gases from a contact sulphuric acid unit. The apparatus consisted of a lead pan bottom on which rested a large glass cylinder representing to all intents and purposes a flue or stack. The discharge electrodes were two wire screen cylinders. One, being considerably smaller than the other, was placed within the large one, each being wound with the asbestos substance mentioned above. Between these, though not touching them, was another

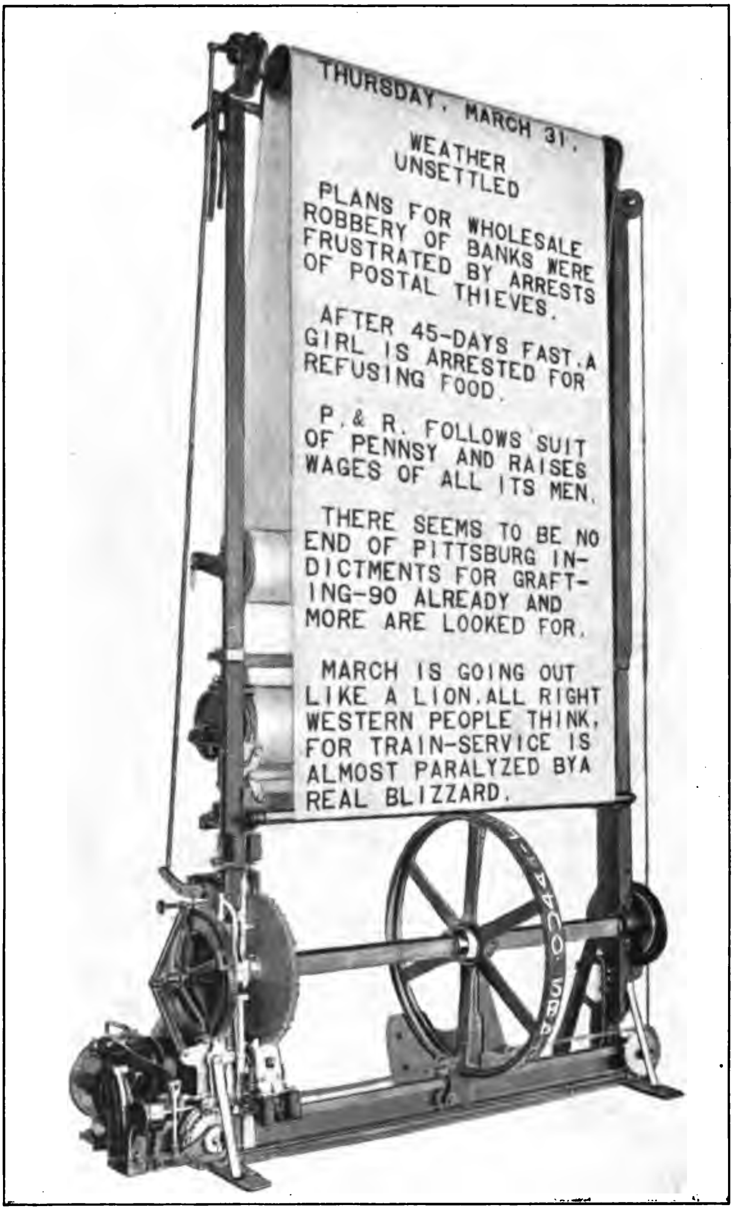
plain wire screen cylinder, which, as we understand it, formed the collecting electrode. The fumes, mostly sulphur trioxide, were first converted into sulphuric acid by contact with water and then passed up through this glass cylinder where electrification by some 6,000 volts precipitated the particles of acid mist as shown in the illustrations marked 1 and 2. The dense white cloud is the mist of suspended acid particles as they appeared normally passing through the cylinder. In Figure 1 the current is turned on and the extent of the precipitation is evident, from the almost total absence of white mist. This particular apparatus received but a small fraction of the gases from the acid unit, and a larger one was built to take care of all the waste fumes. The amount of sulphuric acid thus recovered was very surprising.

The account of the larger installations which were thereafter made is particularly interesting. One of these was at a smelter belonging to a lead company's plant, which each day was pouring forth several tons of lead fumes into the atmosphere, and which for this reason had involved the company in litigation with the neighboring farmers. The sulphuric acid mist pouring from the refinery stack of the plant was the object of first attention. After some experimenting, this mist was conducted through a long vertical lead flue in which were placed rows of lead plates. These were electrically connected and formed the collecting electrodes of the precipitation system, while between each pair of these plates hung a lead covered iron rod, covered with the asbestos-mica material which represented the discharge electrode. The power required to energize the installation amounted to about two kilowatts, and that effective precipitation was obtained is evident from the statement made that often as much as two gallons of sulphuric acid per minute were recovered from the flue, which under certain conditions of operation represented a saving that paid for the operating cost of the plant five times over.

The extension of the treatment to the roasters of this plant was a much greater undertaking, and several difficulties seemed to have presented themselves here. It was necessary in the first place to cool the fumes in order to preserve the lead flue built, and also to insure the fumes being condensed into suspended particles. Sprays of cold water were first tried, but a lengthening

of the flue later seemed to serve the purpose. A muddy precipitated material which collected on the plates had to be washed off about every five hours, but this proved a rather simple matter, the wet material being then drained off at the bottom of the flue.

The largest preciptation installation was made at the Balaklala smelter at Coram, Cal., which was required to handle from 250,000 to 500,000 cubic feet of gases per minute. The installation comprised nine precipitation units, each opening into a common inlet flue on one side, into which the fumes were discharged, and into an outlet flue on the other side communicating with the stack. Each unit contained twenty-four discharge electrodes made by twisting the mica-asbestos material between two iron wire strands, with a corresponding collecting electrode between each one of these. made of sheet iron. Perhaps the greatest difficulty experienced was in maintaining the conductivity of the mica-asbestos, which at ordinary temperatures takes on sufficient moisture from the atmosphere to readily transmit the current, but which in the atmosphere containing zinc oxide met with in this case, had so little conductivity as to seriously impair the efficiency of the system. The power required in this case amounted to 120 K. W. In actual operation the electrodes of this installation could be cleaned by merely shaking them by hand to free them of dust, one unit at a time being cut out of the system for this purpose. The very lowest estimates gave as removed, an average of 72.8% of the total solids in the fumes. The photographs marked 3 and 4 give a good idea of the main stack of the plant as it appeared with the precipitation current respectively on and off.




THE ELECTRIC PRESS BULLETIN WITOUT THE CASE.

# THE ELECTRIC PRESS BULLETIN

*A. H. Soler.*

A RECENT invention is the Electric Press Bulletin, which seems certain to fill adequately a long felt necessity in the newspaper world. This machine, or a number of them, stationed at different places, can be operated by a single man, who from his central station in the newspaper building can print on these bulletins the latest reports from all over the world almost as fast as they come in.

The Electric Bulletin is operated by a small electric motor, of one-fifth horse-power, attached to the left-hand side of the frame, and connected by a feed wire to an ordinary lighting socket, or to a moderate sized storage battery in those localities where public power is not obtainable. Moreover, the operating power is always located at the printing end, thus reducing the amount of current necessary to run the machine in comparison to that amount which would be required if the source of power were at the control point. This permits the use of a small wire between the control station and the machines, such as telegraph and telephone lines have.

The printing apparatus consists of a paper-feed roll at the lower extremity of the bulletin sheet with another roll just in front of it, which serves as a platen on which the characters are printed. The big type-wheel is the actual printing device, with a diameter of about eighteen inches and with forty-four characters around its periphery. The standard size of these characters is two inches and they are made of rubber to insure perfect printing contact. The wheel is inked by a felt roller, charged with pigment, against which it revolves.

The bulletins are all worked from an apparatus at the central station which resembles a typewriter in many respects. To start the machine, the operator presses a key labelled "Start", and this closes a relay attached to the printing apparatus, which starts the motor and the big type-wheel revolving. The operator then touches the key bearing the desired letter and holds it for a

small fraction of a second, until a tiny electric light or sparker before him flashes a signal that the rapidly revolving wheel has stopped when the desired letter has come directly beneath the printing surface and impressed the character on the paper. This operation is repeated as often as desired, the wheel moving automatically one letter space to the right until it reaches the end of the line, when it is returned to the starting point. The jar due to stoppage of the rapidly revolving wheel at the printing of each character is taken up by a pneumatic cushion. The paper bulletin sheet can be moved up one or two spaces as in the ordinary typewriter, and to insure perfect accuracy the words appear in ordinary typewriting before the operator.

As the connection between stations is only over a single wire, an alternating current is used; or, an alternator is employed when the current is a direct one. The current sets in vibration a little fork that looks like the escapement of a watch, and it vibrates a certain definite number of times for each revolution of the type-wheel. When a particular key is pressed, a rotating metal hand, traveling around a dial called a "sunflower", with radiating metal petals, stops at the one designated by that particular number of vibrations, establishing an electrical connection so that the little motor then brings the type-wheel in contact with the paper, and the letter is printed.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

THE YALE SCIENTIFIC MONTHLY wishes to acknowledge the receipt of the following books, which will be reviewed at the earliest opportunity:

*Practical Chemistry for Engineering Students.* By A. J. Hale. Longmans, Green & Co. Price, $1.00 net.

*The Mechanics of the Aeroplane.* By Captain Duchêne. Longmans, Green & Co. $2.25 net.

*South American Archaeology.* By T. Athol Joyce. G. P. Putnam's Sons. $3.50.

*The Normal Child and Primary Education.* By Arnold L. Gesell. Ginn & Co. $1.25 net.

*Commercial and Industrial Geography.* Keller and Bishop. Ginn & Co. $1.00 net.

*Heredity and Eugenics.* By Castle, Coulter, Davenport, East, and Tower. The University of Chicago Press. $2.50 net.

*Microbes and Toxins.* By Dr. Etienne Burnet. G. P. Putnam's Sons. $2.00 net.

*Elementary Entomology.* By E. D. Sanderson and C. F. Jackson. Ginn & Co. $2.00 net.

*Plane Geometry.* By W. Betz and H. E. Webb. Ginn & Co. $1.00 net.

*Examples of Industrial Education.* By F. M. Leavitt. Ginn & Co. $1.25 net.

*Elementary Applied Chemistry.* By L. B. Allyn. Ginn & Co.

*Algebra for Beginners.* By Godfrey & Siddons. G. P. Putnam's Sons. 80 cents net.

*Rocks and Their Origins.* By G. A. J. Cole. G. P. Putnam's Sons. 40 cents net.

*College Zoology.* By R. W. Hegner. The Macmillan Co. $2.60 net.

*Elements for Statistical Method.* By Willford I. King. (New Macmillan Co. $2.00 net.

*Studies in Radioactivity.* By W. H. Bragg. The Macmillan Co. $1.60 net.

*The Early Naturalists; Their Lives and Work.* By L. C. Miall. The Macmillan Co. $3.50 net.

*A College Text-Book on Quantitative Analysis.* By H. R. Moody. The Macmillan Co. $1.25 net.

*Elements of Statistical Method.* By Willford I. King. (New York: The Macmillan Company. 1912. Pp. xvi, 250. $1.50 net.)

The purpose of this little book, as stated by the author, is to provide a simple text from which there may be obtained a general knowledge of the more elementary processes involved in making scientific study of large masses of numerical data. Although the work is designed, primarily, to assist in the intelligent study of political economy, sociology, or administration, it is also adapted to any subject which permits of the use of the statistical method. It may be used to advantage even by those who are unacquainted with the higher mathematics, for only the simplest mathematical theorems are introduced to furnish the basis of the discussion.

The book is divided into four parts. The first part is devoted to a discussion of the historical development of the science of statistics from its earliest and simplest form to its present complex status, and to the nature, uses, and sources of statistics. Part II embraces a consideration of the exact problem to which the statistical method is to be applied, the collection of data, and the standard of accuracy. Part III considers the questions of tabulation, diagrams, averages, etc.; while Part IV is given over to a discussion of the comparison of variables.

At the close of each chapter is a list of references for the use of those who wish to make a more advanced study of certain topics which already have been discussed in an elementary fashion. Numerous diagrams illustrate the discussions in the text. The appendices contain a brief discussion of various calculating devices, and tables of logarithms and squares of numbers.

AVARD LONGLEY BISHOP.

*Assistant Professor of Geography and Commerce.*

*High School Geography, Physical, Economic and Regional.* By Charles Redway Dryer. (New York: American Book Company. 1912. Pp. 536. $1.30.)

Within recent years there has been manifested among educators a growing tendency to modify the geography courses of our high schools so as to include in the subject more of the so-called human element. To this end, serious attempts have been made, here and there, by occasional writers and certain wide-awake teachers to show the broad relationship existing between the physical environment and man himself. The present volume has been prepared entirely in harmony with the movement indicated, in that the author has attempted to outline this relationship between the earth and man, "showing both the dependence of human life upon natural conditions, and the influence of these conditions in turn upon human life".

As the title indicates, the book consists of three parts dealing respectively with physical, economic, and regional geography. The whole volume is expected to furnish material for a year's study in this subject in the high school. To meet the demands of a shorter course of five or six months, Parts I and II are published as a separate volume.

Part I consists of eighteen chapters and covers 262 pages—nearly one-half of the book. Broadly considered, it treats only of those aspects of physical geography which have a more or less direct effect upon man in the struggle for existence. Here, then, is to be found the necessary basis for the discussions which follow. Part II, on economic geography, embraces only 67 pages and,

therefore, seems entirely out of proportion to the other divisions. Here are to be found only four chapters dealing with natural resources and food supply; clothing and constructive materials; heat, light, and power; and manufacture, trade, and transportation. Part III, on regional geography, includes 188 pages, divided into fifteen chapters. Here the world is considered as a number of natural rather than political divisions, each representing a more or less distinct type of physical environment to which human life has adapted itself in the struggle for existence.

The volume contains numerous maps and illustrations most of which have been well chosen. On the whole, the book should prove a valuable addition to the literature on geography for secondary schools.

AVARD LONGLEY BISHOP.

*Assistant Professor of Geography and Commerce.*

* *

## STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.

Of YALE SCIENTIFIC MONTHLY, published monthly at New Haven, Conn., required by the Act of August 24, 1912. Editor, Fred. D. Van Sicklen, 111 Grove St., New Haven, Conn. Managing Editor, combined with business manager. Business Managers, Henry D. Schmidt, P. O. Drawer 20, New Haven, Ct. Publisher, published by members of the Senior Class of Sheffield Scientific School, Yale University. No bondholders. Class publication. Not incorporated. Average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date of this statement; (this information is required from daily newspapers only); 700. (Signed) Henry D. Schmidt. Sworn to and subscribed before me this 28th day of September, 1912. (Signed) Ovilda C. Grenon, Notary Public. (My commission expires February, 1913.)

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'71—J. Frederick Klein has been acting as President of Lehigh University in the past year during the absence of Dr. Henry Sturges Drinker. Mr. Klein is now Dean of the faculties of Lehigh University.

'88—Richard S. Curtiss, Ph.D., for eight years Assistant Professor of Organic Chemistry at the University of Illinois, has accepted the Professorship of Organic Chemistry at the Throop Polytechnic Institute at Pasadena, California.

'96—The engagement is announced of Miss Elizabeth Leonor Valliant of Baltimore to Frederick Chapman. Until recently Mr. Chapman has been engaged in the automobile business in Indianapolis, Ind. He is now located at Albany, N. Y., in connection with the liability department of the Traveler's Insurance Co.

NOVEMBER, 1912



# The Yale Scientific Monthly

VOL. XIX

No. 3

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

# THE
# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. NOVEMBER, 1912. No. 3

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. NOVEMBER, 1912. No. 3

## EDITOR'S NOTES.

### BUSINESS COMPETITION FOR FRESHMEN

THE SCIENTIFIC MONTHLY announces that the competition for the position of Business Manager from 1915 S will start on Wednesday, November 6th, and will run until the following November.

This competition will be entirely separate from that for the editorial positions, which will start after the spring vacation.

The work will be of a business nature only, and credit will be based on the amount of the advertisements and subscriptions secured.

Further information can be obtained at the Office, in Byers Hall basement, 6:45 to 7:30 P. M., daily, except Saturday and Sunday, or from the Business Manager, H. D. Schmidt.

* *

THE 1913 Board of THE YALE SCIENTIFIC MONTHLY takes great pleasure in announcing the election of William Henry Taylor, of Altadena, Cal., to the position of Assistant Business Manager.

## THE SENIOR CHARM COMPETITION

THE SCIENTIFIC MONTHLY annually offers a charm to any member of the Senior Class who shall hand in the greatest amount of material for publication in this magazine. The competition this year will open December 2nd and continue until the spring vacation.

* *

## THE NEW BIBLE GROUP

THE new plan which is being tried of holding Bible Groups at the various Society Houses and Dormitories in rotation should prove a great success. The group is being held every Friday evening at a quarter to seven. A desirable degree of informality is being maintained at the meetings, which we need scarcely state serves the secondary purpose of encouraging visiting around at the various houses. The main purpose of the group, however, as Professor J. W. Roe, the leader, so clearly brought out at the first meeting is to study the Bible's teachings in relation to a "man's life work". We might state that Professor Roe brings this subject down to the plane of every-day life in a manner which should satisfy the most practical minded individual, and which should make his talks of vital interest to all Sheff men. It might be advisable to announce that the meetings for the next few weeks will be held as follows: Nov. 1, York Hall; Nov. 8, Sachem Hall; Nov. 15, Byers Hall; Nov. 22, The Cloister.

* *

## THE FAILURE TO VOTE

THE failure of men to come out and vote when occasion calls has recently been noticed in Sheff to a deplorable extent. Several elections have already been held this year, some of them to place men in very responsible positions in Sheff, and the scarc-

ity of votes cast has not only been surprising but rather disconcerting. In fact we would actually be ashamed to print the small percentage of the eligible voters who appeared at the polls during two important Sheff elections this year, which we have especially in mind. The importance of voting need not be gone into here. Everyone must realize that if Sheff is to continue to hold a position of respect as a department of the University, and is to continue developing as she has developed in the past, it is absolutely essential that the Sheff men maintain their interest in the filling of all important undergraduate offices. We do not believe for a minute that there is any serious, growing disregard of elections in Sheff, but merely that a bad beginning has been made, which should be, and will be, rapidly changed for the better. Within the next few months there will be a number of important elections. Let every man keep pace with the important movements in Sheff, and make it a point to cast his vote when occasion calls.

* *

## ATHLETIC DUES

THE Freshman entering Sheff finds, during the evenings of the first month of college, his room occupied by a bewildering succession of heelers for various publications, agents for pipes, banners, etc., and solicitors for various things. He is not expected, nor would he of course be likely, to contribute to each and every one of these, yet some are absolutely necessary, and great care should be used in separating the wheat from the chaff. Of the former there is none more important than that the Freshman support his teams. Unfortunately, it is not given to all men to play on them, but nevertheless, there is a way that every one can help his teams and through them help Yale, namely, by contributing to the Freshman Athletic Association. The glory of a winning team reflects on the whole class. By contributing, each man may indirectly have a share in winning the victories.

Moreover, it should be remembered that this is the only time during a man's three years at Sheff that he is asked to give anything to athletics. Surely this is little enough to ask.

Therefore, we earnestly urge every member of 1915 S to give as much as he can afford towards the support of the Freshman Athletic Association. It is really a duty to contribute. Let each man help out and thus have a personal share in creating a winning team.

* *

## THE TWO SEMESTER SYSTEM

AFTER consultation of faculty committees from both Sheff and Academic, the two semester system has been adopted. This year it affects the Sheff Freshmen alone, but next year will include all the students in both departments of the University. For the Freshmen, the term will end on February 5, 1913, instead of on December 21—the term ending for the upper classmen. The preceding week is to be devoted to mid-year exams, after which classes will be taken up as usual, the "make-ups" not coming until after Easter vacation. The most objectionable phase of this change, at least to some men, is the lessening of the number of cuts allowed. Instead of twenty-seven absences being permitted during the years as heretofore, but twenty-two will be permitted, twenty-three putting a man on official warning. The fact that all other large universities have adopted this plan, shows that there must be advantages in the new system.

* *

## INTERDORMITORY ACTIVITIES

THOSE who saw the football challenge of Senior Van Sheff to Junior Van Sheff on one of the trees of the Sheff Campus will agree that they were pleased to see an awakening of the dormitory men to the possibilities of interdormitory activity. The fact that the Van Sheff buildings are constructed with separate entries hinders a freer intercourse between the men. So, to those who desire a broader and better knowledge of their dormitory mates, some sort of common interest such as dormitory ball teams

or entry relay teams will appeal as the kind of thing which will help bind the men together.

Such a scheme as this is analogous to the inter society-house pool tournaments of last year and ought to be of as much common interest to the Van Sheff dormitory men as the pool tournament proved to be among the society men.

* *

## BYERS HALL

It is requested:

That you return magazines and papers to their proper places.

That you remove your hat while in the room.

That you maintain an orderly conduct at all times.

When the Byers Hall Committee goes to such pains as to even frame this set of requests, so that it will be in keeping with the rest of the room, instead of hanging up a placard on the wall, it seems but right that the undergraduates in Sheff should try to coöperate with the Committee. Every Yale man is supposed to be a gentleman, and they act as such in going to theaters and lectures. It seems queer that these men, who remove their hats at these places, should not do the same so much nearer home. Politeness and good breeding begin at home. The two main rooms on the first floor of Byers are devoted entirely to those students who desire to come there to study and to read the periodicals and magazines. It is, therefore, only just that these men should coöperate with the Byers Hall Committee and make these rooms what they are intended to be, reading and studying rooms for gentlemen. Don't wait for the others to take off their hats, but do it yourself and set a good example. Again, if you use a periodical or a magazine, it will only take you a second to restore it to its proper place instead of throwing it down where you happen to be, to the probable injury of the paper. Common sense will tell you, if you reflect, that this happens often. Moreover, it will also tell you that your thoughtfulness will greatly aid in keeping the place look-

ing neat. In regard to the third request, a great deal cannot be said, as the conduct of nearly everyone is just what it should be, orderly. Try and remember what these requests are and what Byers Hall stands for; and you will immediately see the use of them and gladly coöperate with the Byers Hall Committee.

* *

## COMMUNICATIONS

[THE SCIENTIFIC MONTHLY invites communications, but does not hold itself responsible for the sentiments expressed therein.]

*Editor of the Yale Scientific Monthly*:

The following suggestion has been made for the improvement in the much talked of cheering, *i. e.*, that the present system of cheer-leaders be replaced by one cheer-leader and several announcers. The one cheer-leader would be in full view of the grandstand and would alone lead the cheers after they had been given out by the announcers, thus making possible more uniform cheering. This system has worked well at Harvard and surely merits a trial.

AN INTERESTED STUDENT.

* *

## A CHAPTER OF THE YALE'S HISTORY IN LABRADOR

*A. B. Reeve.*

BEFORE telling about an adventure with the *Yale* which happened this passed summer, it might be well to give a short history of the boat. In 1910 a number of undergraduates in the University became interested in a movement to raise sufficient money to build and equip a small vessel, which was much needed

THE YALE IN RIGOLET HARBOR, LABRADOR.

by Dr. Wilfred T. Grenfell in his work as a medical missionary among the fishermen of Labrador. The particular need which the boat was to satisfy was that of a tender for a new mission hospital which was being started on the Labrador coast. All the communication along this coast being by water, a small but staunch boat was required to carry patients to and from the hospital, and to handle freight as well. Largely by the efforts of J. T. Rowland, sufficient funds for the purpose were raised by private sub-

scription, and plans for the boat were drawn up by Mr. Charles D. Mower of New York, who kindly volunteered his services.

The result of these efforts was the *Yale*, a splendid boat, forty-five feet long, beautifully designed and built to withstand the severe usage which the Labrador coast entails. As may be seen from the accompanying illustrations she is ketch-rigged, a most suitable rigging for seaworthiness and ease of handling by a small crew. Her sail area is small as compared with that of a yacht of the same size, a desirable feature on the coast, and she is provided with a ten horse-power kerosene engine.

In the summer of 1910 the *Yale*, manned by a Yale crew, set sail for Labrador, and keeping the open in the face of all weather arrived at St. Anthony, without once using her engine, in remarkably quick time. She was delivered, as a report states, "in good condition, free from debt and with insurance paid one year in advance." She was put upon the mail service in Hamilton Inlet, Labrador, running between the hospital at Indian Harbor and Mud Lake at the end of the Inlet, a round trip of some 300 miles. To quote a sentence or two from one of Dr. Grenfell's letters: "For inside work, and keeping on time over the long three hundred mile route, the *Yale* is called upon to perform every fortnight, she certainly cannot be surpassed. . . . She ran the other day, on her route, fifty miles under bare poles, before a gale of wind, and she made three hundred miles in four days, catching the return mail steamer."

The particularly eventful chapter of the *Yale's* history which occurred this passed summer goes back to August 5. The *Yale* had been in port at Indian Harbor on the previous Wednesday and had been well stocked with provisions preparatory to making her regular mail trip. In the evening the patients discharged from the hospital were put aboard, including three women with numerous medicine bottles and two howling babies, and the boat with its crew of three natives disappeared from view. No news had been heard from her now for four days, which was causing a little uneasiness at the hospital, especially since a vessel from Rigolet, the *Yale's* first stop, had reported that she had not reached there, long after she was due. Someone then entered the hospital and announced: "The *Yale* is lost, but all aboard are saved!"

This caused no little excitement, and the skipper who had just arrived with the news was immediately interviewed.

The skipper's story of the accident, coupled with information later gained from the rest of the crew, amounted to the following. After leaving Indian Harbor the *Yale* had run into a dense fog which, together with the darkness of the night, made going difficult. About twenty miles had been covered, or a trifle less than half the distance to Rigolet, with the engine going, for there was little

THE YALE'S CREW. FROM LEFT TO RIGHT ARE SEEN THE COOK, THE SKIPPER, AND THE ENGINEER.

wind. Nevertheless a heavy swell from a strong blow the previous day still disturbed the surface of the sea. At one time the engine stopped, but the engineer immediately started it again. It would have been better if the engine had not started so easily, for not fifteen minutes later the boat struck a half submerged rock, sometimes called Whale's Back. The crew were aware of its presence in the neighborhood, and thought to give it a wide berth, but in the darkness miscalculated on account of the tides, and they saw the danger only after it was too late. The shock of striking

the rock knocked the lamp down, and they were in total darkness. One anchor was thrown out to prevent the boat being dashed further upon the rock, but the rope snapped. The sea was breaking over the rock in a dangerous fashion and when an attempt was made by two of the crew to get out the second anchor in the small dory, the dory was swamped, and not knowing how to swim, the two very narrowly escaped with their lives.

By this time the *Yale*, pivoted on her keel, was dashing from side to side, with every wave. The main boom was swinging back and forth in a manner that made it madness for anyone to get near it, and some trouble was experienced with one of the women passengers, who would not keep below when ordered. One wave swept over the boat and cleared the decks of everything movable, including two kerosene casks lashed to the rigging, while another, catching the mainsail, split it from boom to gaff. The rudder also was torn off by the force of the waves. The crew immediately made preparations for getting the passengers ashore and abandoning the *Yale*. The nearest land was Cato's Island, two miles distant, a small desert place without shelter of any kind. The three women and the two babies and two of the crew, seven persons in all, then managed to get safely into the little dory, and in some miraculous way got safely clear of the boat and rock. The engineer alone remained aboard. The dory was rowed to the island and after the passengers were landed a return trip was made for the engineer, a little food and a sail being taken from the boat at the same time.

With the sail for a tent the shipwrecked company spent the night on the island, never expecting to see the *Yale* again. On the following morning a trap-boat was obtained from the nearest house, about six miles from the island, and while two of the crew rowed the passengers the remaining twenty-two miles to Rigolet, the skipper set out alone in the dory, to inform the hospital at Indian Harbor of the disaster. The weather was stormy and he was forced to go ashore at times, and wait for the wind to abate. Thus he did not reach Indian Harbor until the following Monday. On the morning he had left, the hull of the *Yale* had still been visible, well up on the rock at low tide. In his estimation the *Yale* was therefore in no immediate danger of going to pieces, although a storm meant ruin.

What could be done? The mail-boat had gone south and could be of no assistance. However, we understood that Dr. Grenfell's hospital steamer, the *Strathcona,* was within one or two days' run of the *Yale.* A telegram was dispatched from the wireless station to Battle Harbor to learn of the exact whereabouts of the *Strathcona,* and meanwhile it was decided to try and get a power boat from some of the fishermen which would be valuable in case Dr. Grenfell was out of reach. Unfortunately there was a "spurt of fine fishing" and none of the men could possibly give up their

REPAIRING THE YALE'S RUDDER AT INDIAN HARBOR AFTER THE ACCIDENT.

power boats. One man, however, did offer his extra trap-boat, a cumbersome affair with three sails, which however was of great value later, as will be explained. The next morning a visit to the wireless station resulted in the receiving of a slip of paper bearing the following:

"*Strathcona* gone St. John's. Do best you can.
Have wired Dr. Grenfell."

No help could be expected from that quarter. A chance remark of the skipper's, however, had given us the information

that a steamer belonging to the Hudson Bay Co. was at Rigolet, and would probably be there until the following day. She was northward bound and would, therefore, pass right by the *Yale*. To intercept her and get her to pull the *Yale* off seemed the only course of action left. This was a case where the proffered trap-boat was a necessity. With three sails set to a fair breeze, we were soon on our way hoping to reach Rigolet, 50 miles distant, by midnight. It was very foggy, and now and again an island would flash into view, only to be engulfed again in the white fog blanket. The fog cleared and we found ourselves but fourteen miles on our way. Then the fine breeze died out, and we were obliged to take to the long trap-boat oars. To add to our discouragements, a motor boat which we had hoped to get was seen pulling its fishing schooner out to sea, and then to our great disgust, we caught sight of the Hudson Bay boat steaming on its course three or four miles away. It seemed as if the last chance of getting the *Yale* off were disappearing with the steamer.

A fishing schooner seemed to be the last resort. With its anchors and windlass it might pull the *Yale* off. It was encouraging to see that there were several of these schooners in the harbor where we were forced to spend the night. On interviewing the skippers of these vessels it soon became clear, however, that much as they would like to help, it was impossible for them to do so during the good fishing, at least the amount which would be required to repay them for their services and their loss in fish was absolutely prohibitive. One old skipper suggested that the *Yale* be floated off with casks, and he even offered his two oil casks for two days. It should perhaps be explained that all the fishing vessels carry a few oil casks for cod-liver oil. He had endless faith in oil casks for floating vessels off rocks, four, I think, being the outside limit which in his estimation would be required to do the trick in the *Yale's* case. It seemed the only thing left, and armed for good measure with ten oil casks from various vessels, which were absolutely to be returned in a short time, we started for Cato's Island.

Long before arriving there the *Yale* could be seen, a little white speck with masts slanting away at quite an angle. On the island we found the remaining two members of the crew, the engineer

and the cook. They had removed most of the valuables from the *Yale*, and had made quite a comfortable tent out of the sail—comfortable except for the mosquitoes!

An inspection of the *Yale*, showed that she was very little damaged. There was only one small hole right through her planking, and this was at the water-line and not below it, although her keel and sides were badly gashed. The rudder was gone also. The way in which she stood the pounding which went on the night

A COMMON SIGHT FROM THE YALE'S DECK.

she went aground, all the next day and the next night, before fine weather set in, certainly vindicates her construction. Her position was a strange one. She had come up over a higher part of the rock and was now resting on a flat part, which fitted her heavy three-ton keel so perfectly that nowhere could a cable be forced between keel and rock. At low tide there was perhaps a foot of water on her starboard and one to four feet on her port side.

To attach the casks the anchor chain was run under bow and stern and along the port side. The casks were then lashed down

to this. To keep the chain well down along the keel, holes were bored in it at intervals, into which were driven iron spikes. The chain was then made fast under the spikes. The work went on very slowly as it could only be done at low tide, and even then was partly under water. Moreover, the best way to fasten down the casks and chain was only learned by considerable experimenting. Very fortunately, the weather continued fair. It was soon apparent that ten casks were not sufficient, and that a large anchor and tackle were necessary to give the required pull, for the forward part of the keel was in a bad hole. This necessitated a trip to Rigolet, which was made by two of the crew in one of the heavy trap boats, in which they rowed all night to get there, and all the next night in returning. I mention this, not because of any particular interest in it, but because it shows how hard these men worked to get the boat off. Each was as much concerned in rescuing her as if each were the owner himself.

All this time the casks were being placed to better advantage. One by one they were being fastened down in the most effective places. When high tide would come, the windlass would always be worked, but always with disappointing results—either the anchor would give or the boat would fail to move. One day, while we were waiting for high tide, with great hopes of getting her off, a trap boat was seen coming from the direction of the harbor where the vessels had been, from which the ten casks had been borrowed.

"Bet they are coming for their casks!" said one of the crew.

"Hope they aren't," said another.

Sure enough, the skippers had sent their men with orders to get their casks! It was a discouraging situation. Giving up the casks might mean losing the *Yale*. But the vessels were going north and needed their casks. At this point a suggestion of the engineer saved the day. He asked if the vessels were going to Indian Harbor. The men thought they were. That settled it. The doctor there would see that they received other casks in exchange for these. The men left with notes for their skippers to the Doctor, and the casks were still under the *Yale*.

The next day she came off! It was the fifth day since work had been begun on her. At first it was not clear whether the

boat had moved or whether the anchor had slipped. Running to the stern, it was discovered by a handy rock that the *Yale* had actually jumped four feet! She would come now, for her keel was out of the hole. Sure enough, at first slowly, but soon rapidly enough so that the tackle could be abandoned and the anchor rope coiled directly around the windlass, she slid from the rock, everyone howling like a lunatic, and mad with joy—the *Yale* was off!

INTERCLASS RELAY RACE, FALL MEET, 1912.

# MILITARY TRAINING IN AMERICAN COLLEGES AND UNIVERSITIES

*President James of the University of Illinois.*

DURING the very darkest days of the Civil War, when it looked to friend and foe alike as if the struggle for the American Union were destined to fail and as if the American republic had, as Gladstone declared, ceased to exist, the Congress of the United States, with a magnificent optimism, appropriated to every state in the Union, and made provision for the southern states as well, when they should be restored, a donation of thirty thousand acres of land for each senator and representative to which the state was entitled in the federal congress. The purpose of this donation was to establish colleges of agriculture and the mechanic arts in each state, and the law provided that special attention should be given to those subjects of instruction which would be of special value in the promotion of agriculture and the mechanic arts, not excluding, however, other subjects, and including military tactics.

As a result of this grant, followed up as it has been by other grants ,there is in each state and territory in the Union, a college of agriculture and the mechanic arts, in which military training is a prescribed part of the curriculum.

Those state universities which were the outgrowth of this same grant, like the University of Illinois, incorporated, of course, this provision in their constitutions also.

As a result all freshman and sophomore men in the University of Illinois are required to take regular instruction in military science and art. During these two years, three hours a week is given to this work, including drill.

In my opinion this is one of the most valuable elements in the college training of these young men. I do not believe that any other three hours in the week are spent to any better effect.

The physical effects of such training are worth all the time and energy devoted to it. It has also a moral effect which reveals itself in more than one direction. It fulfills, moreover, beyond any doubt, the purpose contemplated by the original act, *i. e.*, the

creation of a valuable element in our system of national defence.

There were registered as cadets in the University of Illinois regiment during the present year, counting the band, more than thirteen hundred men. Each one of these gets a training in military science and art which, although elementary in character, of course, is still calculated to make him an efficient private or an efficient non-commissioned officer in the national guard, and, in time of war, in the federal army.

The superior intelligence and training of the average college man enables him to get the benefit of military drill in a much shorter time than the average young man of the same age in the community at large. The inspectors of the War Department, who are sent once a year to examine the regiment and report upon the value of this sort of military training from the standpoint of the War Department, have been, almost without exception during the past fifteen years, enthusiastic over the results actually achieved in this work.

Referring to what the President of the United States said in regard to the cadet regiment of the University of Illinois, I may say that in my view the President is correct in his statement that this military training reaches a far larger number of students than any system of sports left entirely to voluntary activity under ordinary conditions in American colleges can possibly do.

The land grant colleges are of course under special obligations to the federal government, owing to the circumstances of their origin, but every ablebodied man in the community, whether in this or other colleges or out of the colleges, owes it to himself and the republic to qualify himself to take an effective place in the scheme of national defence if circumstances should ever call upon his services. There is no way in which he can qualify himself so efficiently and so easily, and with so much incidental benefit to himself, as by participation in regular military drill, and certainly college students have an unusually good opportunity to get this drill under the very best conditions. I may add that in my opinion the compulsory military drill does not develop the exaggerated military spirit which at one time, in common with other friends of the peace movement, I felt might possibly be the result of such training.

# BOYS' WORK IN NEW HAVEN

*Clyde Martin.*

IN New Haven there are five boys' clubs in which students are interested and take an active part. Yale Hall is owned by the University Y. M. C. A. and run entirely by student volunteer help except for the student superintendent. The United Workers Boys' Club is managed by three paid students and by several volunteers. The Oak Street Club is run entirely by volunteer help from the Academic Freshman Class, and the Goffe Street

THE MERCURY GROUP. THREE BOYS FROM THIS GROUP ARE NOW ATTENDING SCHOOL.

Club has been run by students. The Edwin Bancroft Foote Club has four paid men, two of whom are students, and it has over a score of student volunteer helpers who make it possible to carry on the various departments. This club is the largest in the city, having a membership of about a thousand boys. It is supported by the citizens of New Haven and carries on the greatest part of the boys' work in the city.

In the Edwin Bancroft Foote Club there is a great opportunity for work. Working boys of every type from all over the city

come there in the evenings. It is the only place many of them can go unless they "bum" around the streets. The home influence of most of these boys is very bad. The parents are mostly ignorant, hard-working people who have no time to give to their children, and even if they have the time they would lack the desire or the ability to advise them. The parents, in many cases, are more ignorant than the boys.

Many of the boys work in factories where they are thrown in daily contact with immoral and ignorant men. The boys' whole environment both at home and at work is thoroughly bad. The

THE WHOLE CAMP. FOUR STUDENTS RAN THIS CAMP AND DID ALL THE COOKING.

club is the only means through which he can raise himself above this environment. Here these boys come in contact with intelligent men, men who sympathize with them and who can see something good in a boy in spite of his ragged and dirty appearance.

Very few people, except those who are active in boy's work, realize how much a little good influence, a little interest, or a little sympathy means to a boy of this type. Many of the boys who are found in the club are orphans who board in some cheap boarding house and support themselves. There are some who have parents but are practically orphans, and who would be better off without any parents at all. There are others who have good,

hard-working parents who are unable to support the family without the help of the boy, and there are still others who have good parents but they can do nothing with the boy. This latter was the case of Hills, the young boy who shot Frankel last year and is serving sentence in the city jail to-day. All these types are found any evening at the Bancroft Foote Club.

Any student can find useful work to do at this club. Work in which he can see results and in which he will not only elevate himself but will lift some unfortunate boy out of a rut and set him on the right path. There are students needed to take charge

A TYPICAL GROUP OF YOUNGER BOYS AT CAMP.

of group clubs in which they get in personal contact with fifteen or more boys. Others are needed to instruct in the night school in ordinary grammar school subjects. Some are needed to help out in the game room and in the gymnasium, in woodwork and in round table talks. There is plenty of opportunity for any student who has the least desire to help.

The department which last year showed the best substantial results was the Group Clubs. A Group Club consists of from ten to twenty boys. The boys give the club a name and have a small club room in which they meet. Each Group Club has its own room and the boys decorate it themselves. They are

made to feel that it is their room and a place in which they can be by themselves. Each Group Club has a student in charge who is called the Club Adviser. He sees that the boys conduct the meetings properly and he tries to get the boys interested in something good. The boys have their own officers who conduct the meetings and activities of the club. The student is supposed to take an active interest in all the doing of the club and to suggest new activities in which he thinks the boys might become interested. He gets to know the boys by their first names and learns all he can about their home conditions. If the student has any

DID THEY ENJOY CAMP? THIS PICTURE ANSWERS THE QUESTION.

personality at all, he will soon gain the confidence of each member so that he can have good, heart-to-heart talks with each one individually. When a student has reached this stage his powers over the group are almost unlimited. They will ask him for advice on all questions, and by his advice and influence he will be able to inspire good morals and a desire to amount to something in many of his boys. The surprising part about this kind of work, from the student's standpoint, is that he will refrain from some of the things which he has been accustomed to doing, and will lead a cleaner and more unselfish life. The effect on the student is often as great as it is on the boys.

Because of the poor system of night schools in New Haven, the Bancroft Foote Club has started a night school of its own, run entirely by students. There are many boys who are anxious to acquire an education but who have no place to get it. This school will afford a chance to these boys. Already quite a number have enrolled for the coming year.

In the summer the club runs a camp for two weeks. In many cases this camp affords the only opportunity some boys ever have to get out in the country away from the dirty streets. Some of the pictures in this article demonstrate how the boys enjoyed themselves at the Boy Scout Camp last summer which was in the

THEY TAKE TO THE WATER LIKE DUCKS.

charge of four students, two from Academic and two from Sheff.

Following are some of the things which the Edwin Bancroft Foote Club accomplished last year:

One hundred and sixty gymnasium suits bought for the boys, the money earned by them.

Two hundred boys enrolled in Group Club work.

Four boys entered schools as a result of the Group work, one to Andover, one to Mt. Hermon and two to New Haven High School. Through the efforts of the club most of the money for tuition was saved by the boys themselves.

Forty boys helped to positions.

The three members of the gang not mixed up in the affair on the night of the shooting of Frankel by Hills, the seventeen-year-old boy, had joined the club a week before.

Four street gangs brought into the club.

Boy Scouts organized in the club.

Four boys secured positions on the United States cruiser *Machias* as wireless operators, graduates from the club wireless class.

The class in woodwork had 54 boys enrolled for the season.

During last year a class was started to teach the boys the theory and practice of the wireless telegraph. The boys built and operated the only wireless telephone in the state.

A school for working boys was started in reading, writing, and arithmetic. For the first year it was very successful. The instructors were all students.

The Club's drum corps had a good year and played on many occasions.

The orchestra has been in great demand during the past season and has added greatly to the social side of the club.

The dramatic class presented a play before an audience of 400 people.

The class in free hand drawing showed good results.

The physical department gave an exhibition in which 200 boys took part. Leagues were conducted in both basketball and baseball.

The largest social of the year was held on Christmas day. Ice cream, apples, and candy were given to 406 boys.

There were many practical talks given last year by students.

The above is only a brief digest of the work done, and gives one an idea of the scope of activities in this club. It is a wonderful work and is worthy of the coöperation of any student who is willing to sacrifice a little of his pleasure, in order to show some poor, helpless boy the brighter side of life.

# THE MANDANS

*J. Hunt.*

IN western South Dakota, in the basin of the Yellowstone and Powder Rivers, live the Mandans. Supported along with two other comparatively small tribes by an appropriation of about seventy-five thousand dollars from the government each year, this once mighty tribe of people live forgotten. Though they have ever been friendly to the white people, in the early days, as well as later, there are not many evidences of civilizing influences among them. Their schools are not so good as those of their brethren of other tribes and they are not as prosperous. They raise corn and potatoes in a rather primitive way, though some are just beginning to use proper implements. Their other main occupations are breeding horses and making matting, large beads, black earthen jars, and willow baskets.

The Mandans are very unlike the ordinary Indian in appearance. They have light hair which is generally gray even among the very youngest chidren, light complexions and, very generally where they are full-blooded, blue eyes.

Around them is clustered a remarkable tradition, which now is well-nigh forgotten, extremely interesting though, as it, if true, sheds some light on the pages of our country's history which have to do with the days before the coming of Christopher Columbus. It is possible that before that day in 1492, before even the days when Leif Ericson is reputed to have landed in America, white men and Europeans, too, trod the land that is now the United States.

In an old history of Wales, we find that on account of civil wars, a certain Welsh prince, Madoc by name, "prepared certain ships, with men and munition, and sought adventures by seas, sailing west, and leaving the coast of Ireland so far north, that he came to land unknown, where he saw many strange things. . . " The account continues that, leaving the majority of his force in this land, he returned to Wales, and collecting more men, set out again with ten sails and was heard of no more. This occurred in the latter part of the twelfth century, Madoc first landing in this strange land in 1170.

In the eighteenth century, some six hundred years after the disappearance of the adventurous Madoc, we find that certain Welshmen who had come to America discovered in a tribe of Indians, known as Mandans, a language which was remarkable in its similarity to their own. These people told the Welshmen that "they came from white people, but were now Indians." The story further relates that they had lived some time on the Atlantic Coast, but being harassed by so many wars they had crossed the mountains and gone down one river and up another (the Ohio and the Missouri), "where to this day live the fair-haired, blue-eyed Mandans". This story is further substantiated by the native traditions of other tribes. When the Indian chief, Cornstalk, attacked Point Pleasant, he based his hopes, as he afterwards told Lord Dunmore, on the fact that, to quote from him, "Long ago our fathers destroyed the whites in a great battle at the Falls of the Ohio. We thought it might be done again." When Lewis and Clark's expedition explored the falls of the Ohio in 1804, they found there a great mass of hacked and mutilated bones, but the question as to whether they were of white men or red, of course could not be answered.

The winter of 1805-06 Lewis and Clark and their sturdy band of heroes, to whom we owe so much, spent among these Indians, who were so different from other Indians. During this winter at Fort Mandan, they discovered many things, so we find from their records, that would seem to prove that the Mandans were indeed the descendants of Madoc's band. It was the custom of Lewis and Clark to minister to the sick Indians in order to cement the friendship they held for the white men. It was also found that many men and women were the victims of cruel burns, and upon inquiring found that they burned themselves as an expression of grief for dead relatives. In the years 1834-35, George Catlin found this custom still in vogue and ascribed it to the desire to carry out the performance of some Christian service handed down from some far distant ancestor. In 1170 the Welshmen were Catholic Christians and firm believers in saving the soul by means of self-inflicted punishment for penitents. Is it not more than possible, that in the six centuries of savage life the custom could have been corrupted to the burning?

With no outside influences for so many years, tradition could easily have become warped through savage superstition and increasing lack of civilization.

The Mandans had gardens, almost farms, of squashes, beans, corn, and sunflowers. They lived in mud houses and had the town or community form of government. The women had blue eyes and fair hair, little girls with silver-gray hair being more common than uncommon. There existed however among the Mandans that Indian custom of the supremity of man over women. Wives were bought like food and served as servants. The braves when not hunting sat and talked and smoked and fashioned implements of the hunt. The women must never eat until the men were through, must always wait upon their husbands and must be ready to answer the sound of the husband's voice. Small wonder that they were old at twenty-five or thirty.

The boats of the Mandans as a final proof were very much like the primitive boats of the Welsh. Built on the same principle and of the same materials, they form an important link in our chain of evidence.

At the time Lewis and Clark's expedition found the Mandans there were about 1,600 of them living in two main villages. In 1822 a census fixed their number at but 1,200, but ten years later the number had risen to 2,000. The Sioux warriors were always the deadly enemies of the more peaceable Mandans, and the yearly toll of lives that the wars with them exacted was very large. In 1836-37 a terrible epidemic of small-pox swept over many of the Indian tribes and when it had passed and the danger was over, the Mandans numbered but 145. Sad remnant of a race! Since then, however, they have increased in number and now, protected by the White Father, live quietly on their reservation.

Now, that is the evidence as to the Mandans. It seems a secure chain, but we shall never know if Madoc landed and settled with his followers or if he perished in the sea. Wherever he went, peace be to his ashes, for the chances are that his name long forgotten and ignored should be in the front rank of the explorers of America. Columbus was fortunate enough to come home and tell of his achievements. Madoc perished in the wilderness, unknown and honored not at all.

TRACK SQUAD, FALL, 1912.

## YALE MECHANICAL ENGINEERS CLUB

THERE is in Sheff an organization known as the Yale Mechanical Engineers Clubs. It is a fully authorized branch of the American Society of Mechanical Engineers. Its meetings are held once a month. All members of the University are eligible for membership, including Freshmen.

Among the many benefits to be derived from membership is the opportunity for meeting other men interested in engineering.

TERRY STEAM TURBINE IN THE MASON LABORATORY.

This is beneficial both in college and in after life. The informal discussions following the meetings are of especial benefit because they afford the opportunity of questioning and conversing with some of the most prominent engineers in the country. The *Journal* of the American Society of Mechanical Engineers is mailed to each enrolled member of the Yale branch each month for a year. This is an engineering periodical of great value to

students. It contains papers explaining and illustrating the latest developments in their respective fields, and other valuable information.

As in former years, prominent men will address the club from time to time. A new plan will be inaugurated this year. There will be several actual demonstrations of machinery and processes at the club meetings in the Mason Laboratory this year, such as, probably, the Westinghouse Airbrake; the Oxy-Acetylene Welding Process; various motors and engines, and any other interesting machines obtainable. Those in charge faithfully promise to furnish the most interesting subjects.

One other event which will occur during the year will bring the club into prominence. It is planned to throw open the Mason Laboratory to the public and to hold a sort of "Exhibition Night." This will come directly under the auspices of the Mechanical Engineers Club in conjunction with the Electrical Engineers Club. The event promises to be the biggest affair of its kind that Sheff has seen for many a day.

The club is anxious to have as many men as possible enroll themselves as members. Through their aid, both financial and otherwise, the work of the organization can be carried on to a much greater extent.

The officers for the year are President C. Edwin Booth, 1913 S, and Secretary Otis D. Covell.

# THE NEW YORK STATE CANAL AS A SCHOOL OF ENGINEERING

*E. C. Hunter.*

BUT few people realize that it was the construction of the New York State canals, and the Erie Canal in particular, that brought forth the first civil engineers of America. This is of particular interest at this time, because the present barge canal, for which in 1899 $101,000,000 was appropriated, is giving occupation to as many civil engineers at the present time as any other one piece of engineering work now in the course of construction. This barge canal will connect Lake Ontario with the Erie Canal, and Lake Champlain with the Hudson River, making a continuous waterway between the Great Lakes and the Atlantic Ocean. It represents the highest form of a barge canal and is the result of the engineering science developed in the construction of other New York canals.

The phase of this topic we wish to bring up is the manner in which these New York canals, the first American school of engineering, brought forth nearly all the canal engineers who have lined the map of the country with their works of internal improvements. In his address as President before the American Society of Civil Engineers, Mr. Desmont Fitzgerald divides the history of engineering into four periods. The first was from 1785 to 1810, the second 1810 to 1830, the third 1830 to 1848, and the fourth from 1848 to the present. The first was a period of canal agitation and experiment; the second, a period of canal building; the third, a period of railroad building, and the fourth, a period of modern engineering. Using this same classification of periods, we see that with scarcely an exception it can be said that there were no American engineers until the beginning of the Erie Canal in the second period. In the first period, the James and Kanawha Rivers in Virginia were connected, and a canal was built between the Ohio River and Chesapeake Bay. For these earlier works engineers were brought from Europe. Senf, the engineer of the Santee Canal which connected the Santee River

with the Cooper River, was a Swede. William Weston came over from England to conduct the construction of a canal connecting the Schuylkill and Susquehanna Rivers in Pennsylvania.

For twenty-five years, men had been expressing ideas about communications and internal improvements, but public works were spasmodic and without system or definite design. Men seemed afraid to invest capital in such undertakings, and none of the numerous propositions could find expression in actual works of construction.

In New York State, the attempts to improve the natural streams had not proved satisfactory. The people were progressive and were clamoring for canals. As early as 1808, the first legislative enactment directing a survey for the Erie Canal had been passed, and with it came the birth of engineering as a profession in this country. When plans for the Erie were needed, there was no professional engineer in America, so Wm. Weston was summoned from England, but he refused the salary of $7,000 a year on account of ill health. Fortunately, this resulted in the employment of Americans throughout.

James Geddes, a judge and surveyor of Onondaga County and a friend of Simeon DeWitt, the surveyor general, was chosen for the first survey in 1808. For $673, he surveyed the best route for the Erie Canal. In these days, judges and lawyers were as a rule surveyors, for they found a knowledge of surveying very useful in determining questions of deeds, leases, etc., and naturally it was from this class of men that engineers sprang. Until James Geddes was made chief engineer, he continued his duties as judge; but engineering proved more to his liking, and it soon occupied hs entire attention.

Benjamin Wright, sometimes called "the father of American engineering", was also a judge and a surveyor. He had done a little surveying for the Western Inland Lock Navigation, and had learned by experience how to use a levelling instrument. He soon gave up all other duties and devoted himself to canal work.

As has been stated, all efforts to secure the services of the English engineer, Mr. Weston, having failed, the commissioners were in great doubt as to the best course to pursue. Under these circumstances, Mr. Geddes and Mr. Wright, having consulted

each other, appeared before the board, and expressed their confidence in their ability to locate and construct the canals, but expressed a strong desire that the commissioners should feel a little confidence, if they were to be entrusted with the responsibility. Most fortunately for the State, the commissioners gave these engineers that confidence. But in so doing they encountered the censures of the enemies of the canals, in and out of legislative halls. On the Assembly floor, it was tauntingly asked, "Who is this James Geddes, and who is this Benjamin Wright, that the commissioners have trusted with this responsibility?" But really, the commssioners had no alternative—and now it is easy to see that the course adopted was much wiser than to have entrusted the keeping of canals to any one man, as would have been the case had the efforts made to secure Mr. Weston been successful. These two engineers used great discretion in the choice of their assistants. These practical men became able surveyors and then experienced civil engineers.

The enthusiasm caused by the success of the Erie Canal spread like wildfire, not only throughout the State of New York, but throughout the entire country. A demand for engineers was at once created, far beyond the possibility to supply. All the Erie engineers were called to other great enterprises in Maine, Ohio, Pennsylvania and other States, to Canada, and even to the West Indies: the younger men passing on and becoming famous in the third period of engineering history—the period of railroads.

"The State of New York," said the Canal Commissioner in 1818, "may indulge the proud reflection that she possesses within herself the genius, the skill, the enterprise, and all the other means, requisite to the accomplishment of an internal navigation, whose utility will surpass any work of the kind which preceding ages have accomplished."

Another writer said, "It so happened that the Erie Canal, a magnificent undertaking for its day, had the honor of being the first great pioneer work of the American engineer. * * * We are concerned in knowing how such a great project, with a multitude of details all requiring the skill of an engineer, could have been carried to a successful termination in a land where there was

apparently no engineer capable of the task. * * * How could these men, without text books or traditions to guide them, succeed in carrying out so important an undertaking? It was no mediocre task these men had accomplished." To repeat the language of the narrator of the celebration attending the completion of the Erie Canal where he exclaims of the authors and builders of the canal: "Europe begins already to admire. America can never forget to acknowledge that they have built the largest canal in the world in the least time, with the least experience, for the least money, and to the greatest possible benefit."

LEET OLIVER MEMORIAL HALL.

# GOVERNMENT OWNERSHIP OF RAILWAYS

*F. W. Schmidt.*

THE title has a sound of newness to most of us. We may have heard it mentioned casually, or seen it heading a newspaper editorial, but we have not thought it of enough importance to devote any time to looking over the questions involved. To the superficial observer comes the thought that some socialistic crank, who wants the government to own everything, is not satisfied to start on small things but must needs do something large. The man who looks beneath the surface, however, finds that there is a very strong feeling in this country in favor of a change in the management of the railroads.

Those who are conversant with the situation and know that all but four countries in the world have some or all government operated railroads, know that there is coming soon and quickly, when it does come, a sentiment in favor of government ownership. It is bound to come suddenly, because up to within the last two years, the information available to the general public on the question has purposely been wholly on the "anti" side. Putting off government ownership by concealing the advantages is to make certain that when it does come, it will come suddenly.

There is no factor in our modern life so potent as the railroad. Not only is is responsible for our civilization and wealth, in that it furnishes a quick method of transportation and a bond uniting the whole country into one single unit, but it has a great bearing upon the trade of the country. Under the present system the railway transportation is inadequate, therefore commerce is restricted. Restriction of commerce brings about business depression. Transportation has both the power to encourage commerce if abundantly supplied and to restrict it if it can not supply the demands of business. In the hands of the government the railroads would be a powerful instrument, both for the building up of foreign commerce and the encouragement of the largest possible volume of domestic commerce.

Considered from a scienitfic point of view the railroads are poorly managed; they have a great lack of system, are not con-

structed to render efficient service, but merely to make money, yet they have a wonderful political machine. In this country there are nearly as many miles of railroad as in all the other countries put together. There are nearly two thousand different companies with hundreds of thousands of employees. Though the railroads are separate as corporations, yet their interests are common when it comes to politics. In every county the railroads have the picked lawyers in their service; in every State they have men looking after their political schemes. Under the private ownership the employees consider that the interest of the railroad managers is theirs; and should they forget this, they are duly reminded at all elections in which the railroads have any interest. How can this country be free and democratic while such affairs exist?

Not only do the railroads influence legislation, but they use their powers to restrict and stifle competition. They use their power to kill off cheap water transportation which should go hand in hand with the railroads.

Let us, before taking up the arguments pro and con, trace briefly the growth of the railroad in respect to its ownership, both private and governmental.

It was on October 27, 1829, that Stephenson's Rocket made its trial test from Liverpool to Manchester. Railroad building commenced all over the civilized world about 1830. During this year two hundred and six miles of railroads were built by private parties or companies. In 1831, Belgium commenced to build government railroads and has been doing so ever since.

Belgium later permitted private parties to build many roads; but from time to time these have been purchased by the government and the majority of the roads have always been in government control. To-day Belgium owns 2,500 miles of railroads in comparison with the 330 miles owned by private companies. In 1840 Germany commenced to experiment with government ownership. At this time the combined railroads owned by Belgium and Germany totalled 500 miles, against 2,022 miles owned by private companies.

From 1840 to 1870 government ownership lost ground. Austria-Hungary, which owned about 600 miles, sold its holdings to

private parties in 1848. In 1860 Russia sold 400 miles of railroads to private companies. Up to 1860 six countries had tried the nationalization of railroads. By 1870 fourteen countries were experimenting. It was on a small scale though, as government roads totalled only 3,500 miles against the private companies' 75,000.

From 1870 to 1880 government ownership increased from 3,500 miles to 29,000 miles. In 1888 the interest aroused in Europe over this subject of government control was so great that instead of waiting for the census of 1890 the European statesmen agreed on a special railroad census, which was taken in 1888. This census showed that thirty-one prominent nations of the world were practising government ownership.

During this time when the European nations were adopting government ownership, the men who were looking after the interests of the railroads in Congress secured the passage in 1887 of the Interstate Commerce Law, which turned public attention away from the question of government ownership.

From 1888 to 1900 the mileage owned by the governments increased from 64,000 to 157,000. Not counting in the United States, the private roads fell in mileage from 153,000 to 106,000 during the same period. In 1905 the government mileage owned by forty-seven countries was 216,000.

It is not perhaps generally known that there are now only four countries out of the fifty-four of the world where there are substantially no government-owned railroads. The only first-class powers in this quartette are Great Britain and the United States; the other two, Spain and Turkey, having no considerable government mileage.

During 1909 Greece completed arrangements to take over one of her important railways. Of the fifty-four countries in the world as mentioned above, thirty-two own practically all their railways. Among these are all of the Australian governments and most of the European nations. Fifty-one of the countries own and operate more than half the railways on government account. China has lately acquired, and now owns and operates on government account, 471 miles of railroad.

Nowhere is there a backward tendency. Wherever the railroads are in government control we find the people perfectly satis-

fied, and the rates much lower than in this country. The most convincing evidence of the success of government ownership, wherever it has been tried, is that one cannot find advocates of private ownership supported by the public. Speaking of the success in Australia, Chairman Knapp of the Interstate Commerce Commission recently said: "Within the last few months I have had occasion to meet men from both these countries, who are thoroughly well informed, not only as to the operation of the railways, but as to the sentiment of their people, and I was assured that the idea of discontinuing public ownership and allowing the railroads again to go into the hands of private companies would find no support in public opinion or be regarded as one of the future possibilities."

Among the arguments used against government ownership of railways may be stated the following: The government could not keep up the high standard of service now offered the people by the privately owned railways; government ownership is socialism; and, finally, the increase in the number of Federal employees will increase the influence of the administration in power.

The opponents of government ownership say that it could not keep up the high standard of service now offered the people by the privately owned railways. What has the government undertaken in our country that it has not done better than private management could have been expected to do? Has it not built up a postal system that is the marvel of the world? Not only have the governments of Europe owning the railroads kept up the standard which formerly existed, but they have gone ahead and made improvements and changes which the private companies dared not make, because they were looking for profit and not efficient service for the people. Only when the railroad is owned and controlled by the people can we expect that the comfort and welfare of the public will be catered to unconditionally.

It is a significant fact also, that in Belgium, where government ownership has been longest in existence, there is the greatest abundance of railways, there being twenty-two miles of railway per hundred square miles of territory. In Saxony, where it has been next longest in existence, the railway mileage is next in abundance, being nineteen miles per hundred square miles of territory.

If the private railways in this country have a higher standard than the government could provide, why was there a shortage of freight cars in 1906 and 1907? In 1906 corn lay on the ground all winter, potatoes rotted in pits and caves, and all this because cars could not be found with which to move them. People in the Dakotas suffered from cold because the railways could not find cars in which to ship them coal.

Is government ownership socialism? When the free-school system was first established, the opponents of it called it socialistic. The man at that time who had no children was enraged at the idea that he was taxed for the establishment of socialistic schools for the benefit of other people's children. The government has undertaken the carriage of packages in the mails so gradually that it is hard to realize that in doing this it has engaged in the express business. The next step in this direction is the parcels post. Do we realize that in issuing money-orders that the government is doing banking business in the line of selling exchange? The government is engaged in these two kinds of private business because there was a public demand for a cheap and quick carriage of small parcels in the one case and for a cheap exchange rate in the other.

Each time the people turned to the government and obtained what the private companies dared not give. And in spite of this, men say that the government is not as energetic and accommodating as the private companies.

Opponents say that socialism as applied to government ownership means the end of individualism. What is the centralization and combination of all the principal industries by the railroads but socialism and the end of individualism? At the present time the private railways are crushing out the individual at every opportunity and are lending their influence to assist the large operator and the enormously capitalized corporation. Government ownership means that individualism will take on a new lease of life. The small dealer and manufacturer will stand the same chance as the corporation.

The argument against government ownership, which seems most powerful, is the allegation that the increase in the number of Federal employees would dangerously augment the influence of the

administration in power. This is not borne out by facts in the experience of nations which have tried it. It has been experimented with under all forms of government from the referendum-governed republic of Switzerland to the despotism of Russia. Perhaps the country having conditions nearest like ours is Australia. No where has any complaint of this character been heard. It is casting a slur on the country as a nation; for a government under the same conditions is honest and efficient in proportion to the intelligence and probity of its people.

It is a wise man who gives heed to a general movement among the people or the nations of the earth. It is generally the part of wisdom to follow the line marked by an irrevocable decree of advancement. It is good policy not to be too far behind. That was a wise remark of Patrick Henry, who said that he knew of no way to judge of the future but by the past, and he should have added that he knew of no better way to determine what are the duties of the present than by the experiences of others. Any man who looks the situation squarely in the face and coolly takes his judgment and not his prejudices for a guide, will come to the conclusion that government ownership of railways is the policy of the future. Brush a few cobwebs out of your eyes and think what we are doing. The government has instituted a parcels post, and a postal savings bank. View the success of the government in the public school and postal department of long standing, and its success in the pure-food industry, and you will come easily to the conclusion that government ownership is imminent in this country.

# INDUSTRIAL WORK AT YALE

*W. O. Johnson.*

THE Sheffield Christian Association through its Industrial Work is rendering a definite piece of service to many of its members and to a large number of people in New Haven. This phase of Social Service originated in Sheff five years ago and has since spread throughout the colleges and universities of the entire country. Through the agency of the Industrial Department of

ARMENIAN CLASS IN ENGLISH IN BYERS HALL, LED BY SHEFF FRESHMEN.

the International Committee, a greater range of usefulness is expected.

At first this Social Service consisted largely in the teaching of English to foreigners, but has been extended so that now not only the common school branches are taught, but in many instances more technical training is given.

In Sheff last year the work was two-fold: A discussion group for the study of labor problems with addresses by professors, labor leaders, and social workers; and the conducting of classes

for foreigners by students. Both phases were successful in a marked way. Housing problems, wages and working conditions, substitutes for many of the present social evils, were presented in the discussion group. Seven nationalities were represented in the classes for foreigners with a wide range of subjects taught. Forty-four students were engaged in teaching classes. This work reacts upon the college student, and he is benefitted as much or more than anyone else. The contact of the college student with the men in the factories and shops cannot be otherwise than helpful.

This present season a more varied line of activities will be attempted. Stereopticon talks of an educational nature will be given. Noon classes are already being conducted in some of the shops. An effort will be made to open up groups in connection with some of the labor unions for studies of a technical character.

The work has been given great impetus by several of the professors who, realizing the value of this kind of service to the student have already given an opportunity for it to be presented to their classes.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## THE MANUFACTURE OF COKE

*A. S. Keith.*

THE necessity of converting soft, smoking coal into a hard, non-smoking fuel presents itself, for the output of anthracite coal is diminishing very rapidly, while, simultaneously, the output of bituminous coal increases amazingly. This desired non-smoking product is coke and, although it has been made for years, there is still room for improvement in its manufacture.

If a person travels on the main line of the Pennsylvania Railroad from New York to Pittsburgh, he will see, a short distance east of Pittsburgh, miles and miles of coke ovens, belching out fire and smoke, which resemble miniature volcanoes at night. Along the Monongehela River, there are miles of these ovens, and they may also be seen in the south near Birmingham, Alabama, and in the state of Illinois. In fact, near all soft coal fields and steel cities, one will find the manufacture of coke going on, for one blast furnace consumes all the coke that a hundred or more ovens, each of three to five tons firing capacity, can produce at one firing. The reason for the blast furnaces using coke is that they require a high percent carbon fuel with absolutely no smoke and a very little sulphur. Coke is, therefore, the fuel.

Coking, usually, is either a forty-eight or seventy-two hour process, at which three or four tons of coal are used, although there is coke known as "gas-house" coke, which is made from a few hundred pounds of coal in twenty-four and even in twelve hours. This latter coke is generally used in houses. In this quick-method coke, a great deal of gas, high in illuminating units, is given off, which makes it convenient for gas companies. This coke is very porous and is not like the denser and more uniform

coke made by the slow process. We shall consider only the slow process coke manufacture.

Coke is manufactured in what is known as ovens, which are divided into two general classes; the open or beehive type, and the closed or by-product type. In the former class, the ovens are shaped, as the name suggests, like a beehive with a diameter of ten to fifteen feet at the base and a height of six to nine feet. At the top is an opening out of which the smoke pours and into which the air enters. The soft coal is dumped into this opening from cars called "larries", which run on a track over the top of the ovens. Not very many years ago, these "larries" were drawn by mules; then by "dinkies", but the engineers soon refused to work over the intense heat; and now, in up-to-date plants, they are using electric locomotives controlled by levers in a shack near the ovens. In the front of these ovens are doors which are bricked up during a "heat".

The coal, as we have seen, is dumped from the "larries" into the ovens, which are still warm from the previous heat. A leveller rakes the coal, making it even and smooth, after which a "door boy" fills up the doorway with brick and clay; then a tester goes around and sees that no air can get in. Meanwhile the temperature of the coal has been increasing due to the heat left in the walls since the last heat and augmented by the heat in the flues below the combustion chamber. This heat from the coal is absorbed by the walls until they have the maximum amount. Then they send down on to the coal, this heat, which ignites with the inrushing air and thus produces a greater heat, which drives off more hydrocarbons. These hydrocarbons unite with more air and ignite, producing still greater heat. This process continues, the heat penetrating further and further into the coal, until the whole mass of coal has become a brittle, charred mass—coke. The heat, which the walls have received, is kept to a great extent; but upon the next charge, they give it to the new coal, thus raising its temperature.

After all of the coal has become coke, the doors are tapped and the coke "drawn". In a great many places ,this drawing is still done by men, whom you can sometimes see naked to the waist and glowing, as it seems, with the intense heat. The coke,

after being drawn, is left to cool and later loaded into cars to be shipped to its destination.

The beehive process is, as you may see, very simple. The cost to build one of the ovens is comparatively low, ranging from $300 to $500. Some of the modern beehives are being made of concrete; the walls and tracks being reinforced, and the rings and wharfs being plain concrete. In the beehive type, there is absolutely nothing procured but the coke; some of the by-product gas creates a heat to drive off the hydrocarbons, but this is only a small percentage of all that is produced. As the furnaces are operated at atmospheric pressure, it is possible for the air to enter from the outside.

The closed, or by-product, type of oven is the other general class and it is itself divided into two groups; the horizontal flue, of which the Semet-Solvay is the best type, and the vertical flue, of which the Otto-Hoffman, the Koppers, and the Collin are the best. As comparatively few ovens use the horizontal flues, only the vertical type will be discussed here. The latter are usually rectangular in shape and necessarily have the hole in the top and the door in front.

The method of putting in the coal and sealing up the oven is the same for this type as for the beehive. These furnaces, however, are operated at a pressure slightly higher than the atmosphere, which prevents any cold air from getting in. All the air is heated outside of the ovens in regenerators, so that it can be ignited with less gas, which is not the gas of combustion, as it is given off, but is live gas—usually the gas derived from combustion, but cleaned and washed.

The gas, after being cleaned, passes to the heating flues, which are located at each end of the oven. The air, which has been heated to 1000 degrees Centigrade in the regenerators that are located outside, passes through several fire-brick passages in order to absorb all possible heat. The air meets the gas in one part of a combustion chamber and ignites. A large portion of the heat liberated is absorbed by the walls of the passages, thus keeping them hot. This process is reversed after it has continued for half an hour; the gas entering at the top, while the gas inlets at the bottom are closed, meets the air, which has gone through the

oven, after it has been heated by a second regenerator. The products of combustion enter the sole flues, then pass into the other half of the combustion chamber, under the second sole flues into the first outside regenerator, through the chimney into the cleaning apparatus.

The gas, in being cleaned, goes to an air or water cooled condenser, where the tar is solidified, while the ammonia and gases are cooled to 60 or 75 degrees Fahrenheit. The mixture now goes to the tar extractor, which consists of a vessel containing water at a low temperature, in which are immersed perforated glass plates. The gas in passing through these perforations becomes wire drawn, as it were; the globules of tar and some of the ammonia cling to it. These are afterwards collected and treated as desired. The gas is now washed, during which process it loses all of the ammonia. After the two chief constituents have been extracted from the gas, only sulphur and minor chemicals remain, which are taken out by a purifier. This live gas, which is ready to be used again or else to be sold, passes through a meter to tanks.

Some people think that the location of the oven has something to do with the decision of whether it shall be open or closed. However, the most practical men recommend the by-product type, no matter where the oven is located, as there is a greedy market for all the tar, ammonia and other products. Agriculturists use all the ammonium sulphate obtainable for fertilizing their fields. With the increase of gasoline engines, the products of tar, namely; naphtha, oils and the lie, are being demanded more and more. Then, the creosoting of wood, such as railroad ties, signal bridges and so forth, utilize an increasing amount of tar, while much of this product is used for the tarring of roads. Of the gas which is produced and cleaned as we have seen, the first part is usually high in illuminating units and is, therefore, sold to gas companies; the second part, usually high in heat units, is stored in the coke company's tanks to be used again to ignite with the hot air. Generally, 50% to 60% of the gas produced is used by the coke company, leaving from 50% to 40% to be sold.

Although the by-product furnaces alone with no accessories cost $1000 to $1500, and the accessories cost $1500 to $2500, bringing the total cost of the oven and attachments up to $2500

to $4000, as compared with $300 to $500 the cost of the beehive, yet, with each charge, twice as much coke is made in the by-product as in the beehive oven. In addition to increased quantity, there is increased quality as the well regulated flues and the heavier charge turn out a more uniform and a denser coke. The percentage of the by-products varies greatly according to the coal used; but ordinary Western bituminous yields from three to eight gallons of tar; fourteen to twenty-four gallons of liquid ammonia, and about five thousand cubic feet of gas for every short ton. The heating and illuminating units of the gas depend upon whether or not the coal has a large per cent of volatile matter, as well as upon the temperature of distillation of the coal, the weight of the coal charged, the time it took for the coke to be made, and the rapidity of the removal of the gas. If one takes into consideration the increased quality and quantity of the coke, the large amount of gas and the other by-products, he will see that the balance of choice will swing far in favor of the by-product type when compared to the beehive type of coke oven.

* *

## MAKING STEAM BY ELECTRICTY

IT has been found practicable to heat trains which are drawn by electric engines, by means of steam generated by electricity from the engine. The boilers are tubular, and held in a vertical position. In each tube is a heating-element consisting of a tube within which are fixed resistances formed by a nucleus of steatite around which is rolled a resistant metallic wire of special composition and very refractory. Boilers so constructed can furnish about 800 pounds of steam an hour at a pressure of 15 pounds to the square centimeter. The heating-elements are grouped in sections, each connected with independent switches so as to control the production of the steam.

# OUR POSTAGE STAMP

*A. H. Soler.*

UNTIL 1841 letters were carried much as "collect" express packages are handled to-day. The correspondent mailed his missive without paying the carrying charge; and the recipient was thus given the privilege of accepting or refusing it, as he thought best. The result was an endless confuson and expense to the government.

The simple solution of the problem was hit upon by an Englishman named Rowland Hill. He discovered, from a personal experience, that the English government was being cheated by faint cyphers being writen on the envelope where the recipient could easily read it and then return the unopened letter; this set him to thinking, with the result that he conceived the idea of the pay-in-advance postage stamp; which, while it is to-day the smallest kind of negotiable paper in existence, involves the spending of hundreds of millions of dollars annually.

While the stamps of nearly all the European countries are printed from electrotypes, those of North and South America are printed from steel plates. The United States government has spent much time and money in experimenting to find the most satisfactory method, and has adopted that of engraving, although it costs somewhat more than that employed abroad. A comparison of our stamps with those of France, for instance, shows the difference. The former are clearer in detail and stronger in color than the latter, while they fade far less rapidly and are better able to withstand the assaults of the elements.

The paper on which our stamps are printed is the cheapest sort of wood pulp stock, weighing about 14 pounds to every 480 sheets of the size 17X22 inches. A rag stock is not suitable, although tougher and stronger, as its surface, lacking porosity, would interfere with process of gumming.

While the paper is being made, the watermark "U. S." is placed. As the damp fibers are being woven together the mesh passes beneath the copper cylinder, called a dandy roll, on which are raised

the letters "U. S." in groups very close together. These press against the soft forming sheet, somewhat changing the position of the fibers which they touch, and making the points of contact a trifle more transparent than the rest of the paper.

The stamps are then engraved in sets of 400, arranged 20×20. On leaving the printing press they are made to pass through a gumming machine, where a boiling hot preparation of glue is evenly distributed over them. From here they pass on to a dryer, where the glue quickly hardens or sets. The sheets are then perforated, five at a time, and cut into four sections of a hundred stamps each. After being counted they are wrapped in bundles and packed in small cases. These, in turn, are kept in vaults at a low temperature, until shipped to the various post-offices throughout the country. In 1892 the government undertook to engrave its own stamps in its Bureau of Engraving and Printing at Washington, the work previous to this being done by a private company. However, all special exposition stamps that have been issued are not done by the government, but this work has been let out by contract, as it was deemed unwise to go to the extra expense of installing an equipment for handling them.

At the present time the government prints thirty million stamps a day. This has been increased twenty million per day since 1892, and the amount of stamps now used annually is 2,000 per cent greater than in 1870. This great increase is not only due to the increase in population, but also to the arrival of the souvenir post card craze and the growth in number and scope of the mail-order houses and other enterprises entailing the sending out of large quantities of advertising matter.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

*Commercial and Industrial Geography.* By Kellar and Bishop. Ginn and Company. $1.00 net.

The authors of this small book have endeavored to place in the hands of younger pupils in the seventh and eighth grades of grammar school a textbook on commercial and industrial geography which can be readily understood. This is no easy task in dealing with a subject of this sort, but the authors have overcome all difficulties and have produced a book which is not only plain and logical but also interesting. The book deals with the three great needs of man, *i. e.,* food, clothing and shelter; and in this way the facts of the commercial and industrial organizations are brought out. Every important fact is dealt with in such a simple and interesting way that the student will not be very apt to forget it. Every-day examples are brought in to impress the fact upon the mind. The beauty of this book is the simple and logical way in which it is written, and the abundance of fine illustrations which are found on every page. These pictures illustrate the various industries in all parts of the world and should prove very interesting to boys and girls of the grammar school age who are, as a rule, greatly impressed by pictures.

The book first takes up the industries of the world, showing the industrial regions. Then it deals with the industrial regions of the United States and illustrates by a sample industry. It then takes up food and food materials, showing the distribution in the United States and then in other countries, with an illustration of a sample food industry. Next it deals with clothing and clothing materials, showing uses and varieties and the materials used in making clothing, with an example. The distribution of cotton and its culture is next considered, also its transportation,

manufacture and the factory system in the manufacture of cotton. Lastly, the book takes up shelter. Under this head houses and house material are considered and also the modern dwellings in country and city. Twelve pages of questions for review follow.

The book from beginning to end is a clear, logical and interesting textbook on a subject which grammar school students, as a rule, are unable to grasp. It should become very popular and will fill a long-felt need.

*Plane Geometry*.. By Betz and Webb. Ginn and Company. $1.00 net.

Here is a textbook which is different in its handling of geometry than anything of its kind. It is divided into two courses, *i. e.*, a preliminary and a demonstrative course. The main value of this book lies in the preliminary course. Too many students are discouraged at the very beginning of plane geometry because of the fact that they are rushed headlong into the subject without sufficient preliminary training, and, consequently, they run up against a snag when they try to undertake the more difficult parts of the course. This preliminary course has been treated in four ways, *i. .e,* (1) to vitalize the content of all definitions by abundant illustration and discussion; (2) to cultivate skill in the use of ruler and compass through interesting drawing exercises, none of which is so difficult as to lose its force; (3) to present exercises requiring for their solution simple reasoning and inference; (4) to develop gradually the conviction that formal proof is necessary for further advance. The idea of this preliminary course is to give the student a good, solid foundation in a plain and logical way, so that he will be able to think clearer for himself and will be able to go ahead with the harder problems armed with a better and firmer knowledge of the fundamentals.

The demonstrative course is arranged along logical and psychological lines. The authors have reduced the usual list of theorems, doing away with some in order to reduce the barriers as much as possible which often cause the student to become bewild-

ered. The list of theorems in this book are entirely adequate. They are put forth in a simple way and are arranged in careful sequence.

This plane geometry is an accurate textbook, arranged in the simplest form and yet giving abundant attention to detail and especially to the preliminary or foundation work.

*The Minister of Police.* By Henry Mountjoy. The Bobbs-Merrill Co. $1.25 net.

The scene of this story is laid in France during the reign of Louis the Fifteenth. It deals almost entirely with the noble or privileged class, and draws a vivid picture of the corruptness and immorality of the court, from which the King himself is not exempt. After the first few chapters the action begins to increase until it almost reaches the straining point. The story revolves around a young Frenchman of noble birth who becomes infatuated with an Austrian woman sent to Paris in the employ of the Austrian government. The nobleman is in sympathy with the common people and is a member of the Society of the Midi, a society of revolutionary ideas. He finally is forced to renounce his family and becomes a fugitive upon whom the Minister of Police is very anxious to lay hands. He gets into all kinds of tight places; is arrested and put in the Bastille, escapes and fights a duel and barely gets away. All the time the Austrian woman remains by him, and after many narrow and thrilling escapes they flee together to England.

The book is very well written. The plots and counter plots are cleverly handled. One things leads up to another until finally everything seems to burst at once, holding the reader spellbound. It is one of those kinds of books which are hard to put aside until finished.

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'05—James Curtis is Vice-Consul at Bridgeburg, Ontario, Canada.

'06—A daughter was born on May 1st to Mr. and Mrs. Guy Huchinson at New Britain, Conn. She has been named Carra Margaret Huchinson.

'08—T. A. D. Jones is assisting in the football coaching at Phillips Exeter Academy.

'11—The engagement of Miss Marjorie Pierce of Bridgeport, Conn., to Horace B. Merwin of the Bridgeport Trust Co., was recently announced.

DECEMBER, 1912



# The Yale Scientific Monthly

Vol. XIX

No. 4

PUBLISHED BY MEMBERS OF
The Senior Class of the
Sheffield Scientific School
Yale University

# THE
# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.
Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.
Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.
All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.
The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. DECEMBER, 1912. No. 4


FATIMA
TURKISH
BLEND
CIGARETTES
Cameron & Cameron Co.
RICHMOND, VA.
NO GOLD TIPS BUT FINEST QUALITY

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. DECEMBER, 1912. No. 4

## EDITOR'S NOTES.

### THE SENIOR CHARM COMPETITION

DECEMBER second marked the opening of the competition for the Senior Charm, annually offered by THE SCIENTIFIC MONTHLY to that member of the Senior Class who shall hand in the greatest amount of material. It should be remembered, however, that the quality of an article aids greatly in determining its value and pictures add to its interest. These articles do not necessarily have to be on a scientific subject but on subjects that will interest any one. The editors will be glad to answer any questions or to give any desired information.

This competition opens a literary opportunity to many men. In the engineering courses there are many who have the ability to write, but who, unfortunately, have had no incentive offered to them to develop this ability. The main purpose of this competition is to offer to the men in these courses this incentive to write. There are men in the Select Course who, although they have had more time and opportunities than the engineers, desire to obtain more practice. The nature of the competition forces men, under many conditions, to go to the library for

definite facts on the subjects on which they are writing. Here we find another advantage. In the course of one's hunts through the books and catalogues, he acquires, unknowingly, an astonishing amount of general information that may be of use to him in after life.

About this time every year some members of the Senior Class, who commence to review their Freshmen and Junior years, ask themselves if they have taken advantage of the extra-curriculum activities. Unfortunately, some find that they have not, while others wish that they had accomplished more. Therefore, we wish to urge all, who can possibly do so, to take advantage of this opportunity,—one of the few left,—and to obtain from it all they possibly can.

* *

## SHEFF NUMERALS

FOR some time the question has been agitated as to whether Sheff Freshmen should receive their own numerals instead of the Academic numerals, as they do now. Because of the fact that Sheff is a three-year course and Academic is a four-year course a complication necessarily arises in regard to numerals. Ever since Sheff has taken part in the athletics of the University she has had to accept the College numerals. Her members have been constantly mistaken for Academic men and obliged to explain that they are Sheff men, and that the numerals they wear are the numerals of the College class and really not their own, although they have won the right to wear them. We strongly feel that Sheff men should have their own nummerals, the numerals that represent *their* class, and that they have the right to the distinction of being Sheff men. Surely Sheff now has as many representatives on the athletic field as Academic. Then why shouldn't Sheff enjoy equal privileges in every respect?

We would propose that the straight numeral (1915) be given to the Sheff members of our Freshmen teams, and that the Academic Freshmen receive 1916 numerals. This will look strange at first until we become used to it, but it is no more inconsistent than our present system, where a 1913 S man wears 1914 numerals. By our proposed system, the undergraduates would soon become used to seeing the two sets of numerals on our Freshmen teams and they would be able at once to tell a Sheff man or an Academic man by the numerals he was wearing.

In our opinion, this would not tend to separate Sheff from Academic, as some men seem to think. The Freshmen teams are University teams. They represent the whole University. They do not represent only Academic or only Sheff. They represent both. Then why hasn't Sheff the right to demand her share of recognition, not in Academic terms, but in Sheff terms? This change in the numeral system is of very small importance to the University, but it is of great importance to Sheff. We doubt if Academic would care one way or the other what numerals Sheff men wore. Instead of separating Academic and Sheff this system ought to pull them more together, for it would put them both on a more equal footing, as the two Sheff major managerships have done.

We earnestly hope that the Senior Councils of both Academic and Sheff will take this matter up and either recommend this new system of numerals or devise a similar system that will give Sheff *her own* numerals and recognition.

* *

## A CLASS GATHERING

IT is felt by many upperclassmen that a gap exists between the non-society men and the men of the Sheff societies which opposes the unity of our class. It was to obviate this that three years ago the different societies entertained the upperclassmen of the school at their houses, a different society acting as host each time. This was not considered a success at the time

although the men of the other societies and some of the non-society men enjoyed it. One of the reasons for the lack of success was that many of the non-society men felt stiff in the society houses regardless of the hospitality shown by their hosts.

To obtain the same ends, *i. e.* to bring the upperclassmen together on some common ground, a gathering in Byers Hall similar to the smoker which was given in Freshman year would promote a broader knowledge of one's classmates without the stiffness which was felt in the society houses.

Some entertainment might be provided and it is probable that all the men would put themselves out to become acquainted with one another rather than gather in cliques which would oppose the aim of the meeting.

* *

## SENIOR ASSESSMENT

IT has always been the custom to assess every member of the Senior Class a fixed sum in order to meet the various expenses of the class. The two big items are the Class Day expenses and the cost of the Senior Class History Book. Every member of the class receives a Class History free. The money left over after meeting all expenses goes into the Class Fund. This fund is very important. Upon it rests the amount of information and completeness of the booklets sent out to every member in future years telling what each member of the class is doing, and giving an account of each man since he graduated. This information will be of priceless value to us when we are separated all over the country. The size and completeness of these books are regulated by the amount of money which the Class Secretary has to spend. Therefore, looking into the future, it is essential that we make our Class Fund as large as possible. This means that every man in the class must do his share.

The assessment is twenty dollars a man. There are eleven collectors whose duty it is to get all this money in. The five members of the Class Book Committee, the five members of the

Class Day Committee, and the Secretary of the Senior Council compose the collectors. There is absolutely no graft connected with any of the assessment. Each collector has a definite number of men whom he is responsible for, and he must give a receipt for all money he receives. He is responsible for all the stubs in his receipt book.

Collections begin about the first of December. It is urged that every man who can, should pay his twenty dollars as early as possible and thus ease the thankless and tiresome task of the collectors.

* *

## SENIOR SELECTS

WHAT is expected of a Senior in Sheff? This might seem like a childish question, but upon the answer of it depends not only the way outsiders look at the Senior Class, but also the way they look at the Sheffield Scientific School, for people judge the School mostly by the Senior Class. Now the Selects compose over half of the Senior Class and, therefore, their actions reflect greatly upon the whole class. We are sorry to say that these actions have not been as they should. If outsiders could attend the Economic or Organic Evolution classes, they would have a very different opinion of what Sheff really stands for. They could hardly fail to feel that they were looking at a high school or even a grammar school class. Seniors in college, and even Select Seniors, are supposed to be matured, and are given the credit of being able to conduct themselves like men. Evidently this supposition is misplaced. In the above two classes the men have acted more like children or ignorant boys than they have anything else. Even in a kindergarten they would not be allowed to carry on so, and children in kindergarten show a better knowledge of the fundamentals of common decency than do the Senior Selects. The latter do not know what respect is due to a professor, or if they do know, they fail to show it, even in its simplest form. There are always a few fools in a class and the

Select Class is no exception. If anything, from appearances, this class has an unusual quantity of this type of man. If he could only see himself as others in the class see him, he would not think himself so funny. He would gradually come to realize that the antics which he goes through, for, as he thinks, the amusement of the class, are frowned upon by all men who stand for anything in the class. There is a large number of the class who make him think that he is the whole thing by laughing at him and, therefore, encouraging him.

We are thoroughly ashamed of the actions of the Select Class and sincerely hope that the class as a whole will come to realize that they are being misrepresented by the hopeless few, and will frown upon all actions in the class room which are indecent, or which do not show the respect due to the professor, and also those actions which are simply "rah-rah".

* *

## SHEFF MEN AND INDUSTRIAL WORKERS

A NUMBER of Sheff undergraduates are regularly coming in contact with small groups of New Haven's industrial workers, are educating them in certain lines, helping them, and brightening their lives, and in turn are gaining experience and knowledge for themselves which will be of value in after life.

Those who have not this year followed the progress of this industrial work, as it is called, at Sheff, would doubtless be surprised to learn the facts. The work is progressing as never before, the enthusiasm of the men engaged in it almost insuring success. Classes are now being successfully held at over twenty points throughout the city, and more classes are being started each week, great care being, nevertheless, taken to organize each class thoroughly and effectively.

An industrial work conference was held very recently in New York City which afforded an excellent opportunity for comparing the Sheff work in New Haven with that carried on in a number of important eastern industrial centers. It appeared that the scope of the work at Sheff was in no wise inferior to that in other places, in fact Sheff stood as the pioneer in several

phases of the work. The teaching of English to foreigners seemed to be the one great aim of the work in most cases, one firm wisely or unwisely going so far as actually to make attendance of their employees at the English classes compulsory. The Sheff work, on the other hand, has been extended to include not only the foreign but also the American industrial worker, such additional subjects being taught as Arithmetic, Mechanical Drawing and First Aid. Both noon hour and night classes are being held, and a number of the groups meet in the homes of the working men, another unique phase of the work.

The normal group, held at twelve o'clock in Byers Hall on Sundays, is a vital factor in the work, for not only is the method of teaching here discussed, but the connection of the work with the larger industrial and social problems of the country is brought out by well known speakers. More and more men will be required for the work as time goes on, and all those who are interested should not fail to enter the work as soon as possible.

* *

## INSIGNIA

WE are all familiar enough with the white hats worn by men who have won their insignia. No doubt we have all wondered why these hats are habitually worn with the insignia in the rear. There is no rule which would prohibit one from wearing his hat with the insignia to the front; yet no one does it. Things have been done and always will be done at Yale according to custom or tradition. And every custom and tradition Yale has, has been created by conditions which warranted it. Wearing one's insignia in the rear of a hat is not according to custom or tradition, it is purely resultant from false modesty. A man who is awarded an insignia sweater does not wear it backwards. Why make a distinction in the case of hats? The ideas are mutually correlative. It is an insult to a nation to fly her flag upside down. Wearing an insignia hat backwards comes in exactly the same category. We do not inflict this insult intentionally but are led to it unwittingly through false modesty. Insignia are awarded to men in recognition of their services. Let us show ourselves appreciative and wear our insignia respectfully.

## PROFESSOR ROE'S BIBLE CLASS

THE Bible Class for the Juniors and Seniors led by Professor Roe is proving a great success. The meetings are being held at a different dormitory or society house each Friday evening at a quarter of seven. The attendance has averaged about forty. The teachings of the Bible are being studied with relation to a man's life work in a virile way which should not fail to interest every undergraduate.

* *

## CONCERNING THE CHRISTMAS HOLIDAYS

THE length of the Christmas vacation is of great importance to the western man, in that it decides whether or not he will be able to go home for the holidays. Three years ago the length of the vacation was changed from three weeks to two. The reason given for this was that it would be better to have a week longer vacation in June. However, one week more or less at that time of the year is of much less importance to a man who has a long distance to travel than it is in December.

What is Christmas vacation? Is it merely a rest for the undergraduates and faculty or is it more? It most assuredly is more, for it is at Christmas that families reunite and home ties are bound the closest. Under some circumstances members of the family are absent, and not only does the absence from home festivities greatly lessen the happiness of the absent one, but it also leaves at home a vacancy which cannot be filled. How can an undergraduate enjoy his vacation the way he ought when he is in a practically strange land and without friends? Undoubtedly he will enjoy his vacation to the best of his ability, but how? By going to New York, where his Christmas feast will consist of a forty-five cent order of turkey and a box of cigars from "the Old Man at home."

If, as we see, Christmas is more than purely a rest from the strenuousness of undergraduate life, why should not our vacation

be arranged so that we could utilize it to our best advantage? This principle has been recognized at most eastern colleges. Dartmouth, for example, only this year, lengthened her Christmas vacation from two to three weeks, on account of the increased number of western undergraduates. And yet Yale, who has the largest number of western men of any eastern college, has, in the last three years, cut down on her Christmas vacation, and from all appearances this change is final.

To the writer at least, the curtailment of the Christmas holiday seems a mistake. Why not make it possible for those men, who are handicapped by living at a distance, to return home for Christmas? It is hard for the members of the faculty to see this, for all they have to do is to walk four or five blocks and they are home. To a western man, however, three weeks vacation for the Christmas holidays, or "travelling time" in proportion to his journey, would mean a great deal, and would only slightly affect the courses of the University.

* *

## WOOLSEY HALL RECITALS

MUCH interest has lately been evinced by the students of Sheff in the Woolsey Hall recitals. The attendance, although it has been gratifyingly large, would undoubtedly be much larger except for one unfortunate circumstance. The presence of many students at these recitals, which are held at four o'clock in the afternoon, is, in a deplorably large number of cases, prevented by four or five o'clock recitations. Since the majority of Sheff students have recitations almost every day at these hours, the Woolsey Hall attendance is necessarily very much reduced. It is certainly to be regretted that so large a percentage of Sheff men are thus prevented from attending a series of recitals which they would find both interesting and instructive. Could the Faculty find some means of transferring the afternoon recitations, on the days of Woolsey Hall recitals, to some more convenient hour, many students would be materially benefitted. This, it would

seem, could be done without occasioning much inconvenience. Such an arrangement would be so beneficial to a large number of men, that its consideration seems to us important.

* *

## LEET OLIVER BUILDING

WE are repeatedly informed by various members of the Faulty that the Leet Oliver Memorial Building is one of the most up-to-date and best adapted recitation buildings in the country. This may be so, but it is hard to impress the fact upon a student who is forced to sit in a seat where the sun blazes unmercifully upon him for an hour. Almost every room in this building is exposed to the sun during some part of the day, and this means that half of the men in the class which happens to be in the room at this time are made uncomfortable. We should think that if shades were put on the windows, they would add greatly to the comfort of the students. To be sure, shades might detract somewhat from the appearance of the building, but, on the other hand, they would make the building much more efficient. And after all, isn't the efficiency of a school building the most important feature?

* *

## COMMUNICATION

{ THE SCIENTIFIC MONTHLY invites communications, but does not hold itself responsible for the sentiments expressed therein. }

*To the Editor of The Yale Scientific Monthly*:

The manner of cutting classes, or of putting classes ahead by instructors in Sheff at the time of big games or special functions seems to be very inconsistent. In order that many fellows could get away early for the Princeton game several instructors in the Engineering Department cut their Friday afternoon or Saturday

morning classes. In the Select Course, although petitions were made by the various classes and given to the instructors, asking them to give a cut, they had no effect. In most every case the instructor explained his position; that in regard to cuts he was entirely under the supervision of the Director, and that the fellows should use their cuts for these occasions; that students are allowed cuts for just these things.

Far be it from me to knock any rule of the School. There surely must be a rule on this kind of cutting. Then why isn't it adhered to by all departments? Is it right that those in the Engineering Department should receive special favors which those in Select do not receive? I think there should be some definite stand taken on cuts by *all* the instructors at times of the big games. Whether or not the instructors in the Select Course are more conscientious or are less good-natured than the instructors in the Engineering Department, the fact still remains, that the latter department confers special privileges which the Select students do not get.

The reader has most likely guessed that I am a Select man. He will say that I am just a "sore head". He is right. I am a "sore head," and it is because I had six recitations on the Friday before the Princeton game; four regular recitations and two that had been put ahead from Saturday. I was very anxious to leave town Friday noon, and to do so I had to take three cuts, 'while my room-mate, who is an engineer, got cuts in all his Friday recitations and left town early Friday morning. I feel that I have a good right to be a "sore head".

(Signed) SELECT SENIOR.

DR. DANIEL COIT GILMAN, '52.

*Courtesy of Alumni Weekly.*

## WHAT DANIEL COIT GILMAN HAS DONE FOR SHEFF

*E. Carlisle Hunter.*

SHEFF is greatly indebted to Daniel Coit Gilman though but few undergraduates realize who he is and what he has done for our branch of the University. He was born in Norwich, Connecticut, in the year 1831, and got his early education at Norwich Academy. Later he came to Yale, where he entered Academic, during which time he became interested in the Scientific School which had just sprung up. After a trip abroad, he returned to New Haven and began his connections with Sheff, which was then changing from disconnected departments to one whole. Gilman had made careful study of French institutions where the "new education of sciences" had been fruitful, and so was better equipped to speak intelligently from both the Academic and Scientific standpoint. While being engaged in raising funds for the school, he started in as assistant librarian of the University. Even this did not occupy all his time and he was elected to the Board of Education, and later to the position of acting school visitor at a salary of $750.00 a year. During his administration as College Treasurer, which office was made open to him, Lincoln passed an act donating public lands to States and Territories providing colleges "for the benefit of agriculture and mechanical arts". The amount for Connecticut was too small to found a new school, so it came to Sheff, which was already partially equipped with buildings and apparatus. Though this act was withdrawn inside of thirty years, it was of great importance because it carried the school through the critical period. Gilman worked hard to obtain this donation, but he did so well that nine years later he was selected to go to Washington in connection with an additional grant.

For nine years, too, Daniel Gilman taught in Sheff political geography, history and political economy and was the founder of the Select Course. In 1866, he was elected to Sheff as Secretary and fulfilling the requirements of this office became his first object. He started an advertising campaign through the

medium of newspapers and pamphlets, so that the Scientific School became very well known throughout the State, more students coming than could well be accommodated.

It was then that Mr. Sheffield gave $10,000 for the purchase of books for the institution, which gift did much for inspiring the faculty to fruitful efforts. Gilman and his colleague, Brush, were trying hard for $2,000 to start a reference library. They got the amount within a few months and Gilman was made librarian.

A course of eighteen lectures to mechanics was given by the professors of this department for the first time, in 1866, and was attended by two hundred persons, "most of them engaged in practical operations of life". This proved such a success that a fund was started for the purchase of physical apparatus to be used in this course.

At this time, the entire endowment for Sheff yielded less than $14,000, including the income of the land grant; and the income from tuition added only $8,000. To increase this, the governing board in 1867 made a special effort to raise a permanent fund. Meetings were held in New Haven and other parts of the State for the purpose of raising $100,000 to defray the current expenses of the establishment, the income only to be expended, and the principal to remain forever as "the General Fund of the Scientific School". The response to the appeal was, however, disappointing.

In 1868, the rapid growth of Sheff made an increase in the funds more imperative. As Gilman says in his report of that year: "Before 1860, there were but two classes of students, those engaged in the chemical laboratory and those who were studying civil engineering. In accordance with public demand, as our program of studies indicates, special professional or technical education is provided for chemists, metallurgists, civil, mining and mechanical engineers, agriculturists, geologists and naturalists. We are also called upon to provide a special disciplinary course, closely corresponding to the Academic course; and likewise, higher courses of instruction suited to the wants of those who have already taken their first degree, and are candidates for a second. Thus, the students of the department are divided into

not less than 17 groups or squads, each having its own prescribed curriculum, and there are also several independent students pursuing their special researches. All this involves the necessity of a large corps of teachers, everyone of whom aims to be proficient in certain chosen branches of study. . . . We are only kept back, by the lack of a sufficient number of teachers, from making the regular course extend through a period of four years."

The Scientific School progressed but its fiscal difficulties did not diminish. There came an announcement that, by a change in the investment in the land grant money, the interest was, at least temporarily, so reduced that the salaries must be cut from $2,300 to $2,000. As Gilman stated at that time, the professors stood by Sheff, because they believed some day it would become a "vigorous college of science".

In February, 1871, Sheff was incorporated. This was strongly advised by Mr. Sheffield, who desired to have the Scientific School independent, in the control of its property, of the corporation of Yale College; not from want of confidence, but from the conviction that this would be the best way. This act of incorporation was followed by a new gift from Mr. Sheffield of a lot of land on Prospect Street close to the School, "with any building or buildings I cause to be erected thereon". The building which Mr. Sheffield caused to be erected there, was devoted to lecture rooms, class rooms and collections.

In December, 1870, President Woolsey gave notice of his resignation, and the question of his successor became constantly agitated. Many names had been mentioned in this connection with the office, and among them, that of Gilman, a favorite candidate of "Young Yale". Several of the men who worked with him in Sheff also thought him an ideal man for the place. As the time of the election drew near, it became evident that the Yale Corporation would not uphold anyone so closely allied with the "new education", and that there was practically but one candidate in the field. That Daniel Gilman was already marked out as preëminently qualified for the executive head of a large University is clearly shown by two calls he had received from the Universities of Wisconsin and California, and it is interesting to speculate upon what would have been the result for Yale if these qualities had been recognized by his Alma Mater.

After a trip West for the inspection of the National Schools, he decided to accept the presidency of the University of California, which had again been offered him.

Yet Daniel Gilman might well feel that he was leaving Sheff in a flourishing condition. During the six years in which, as the next report says, Gilman was the principal exponent to the public, the number of students had more than doubled, while the number of courses had risen from three to eight, its buildings had been enlarged, a second one donated by the same generous hand, a library had been endowed and catalogued, the valuable Hillhouse Mathematics Library had been added to it, an excellent collection of mechanical models and apparatus had been given, and collections of various sorts had been started. Instead of leading a precarious hand to mouth existence, a substantial addition of $250,000 had been made to the Endowment Fund, and a new Professors' Fund of $50,000 was well under way. Best of all, the Sheffield Scientific School had made itself known and respected in the world and had acquired a host of friends, and such a position that even the other departments had begun to admit that it was worthy of a place among them.

# THE NEW ELECTRICAL LABORATORY

*H. L. Wadsworth.*

THE very rapid growth of the Sheffield Scientific School has necessitated the addition of many buildings, the foundation for the latest of which is just being laid. This building will, when completed, be used by the Electrical Engineers, and called the Electrical Laboratory. It is to be situated on the Sheffield Square facing Hillhouse, between Kirkland Hall and Leet Oliver, and when completed will cover the entire space between these two buildings. At present, however, only one-half of the building is to be erected. The old Biological building now stands on part of the ground which the completed building will occupy, and as soon as the new Biological building is finished at the corner of Prospect and Sachem Streets, the old one will be torn down.

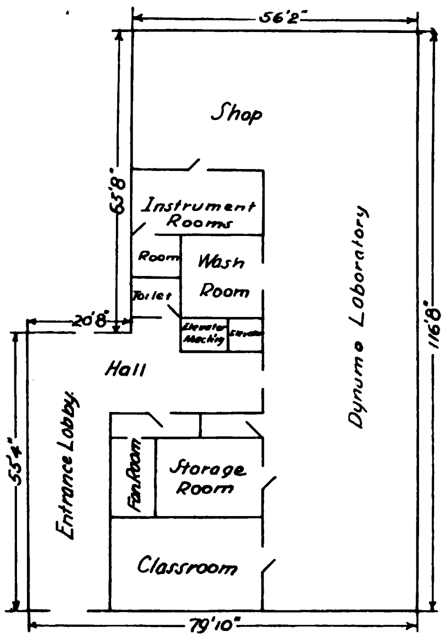
The erection of this Electrical Laboratory has been made possible through the generosity of Mr. Austin C. Dunham of Hartford, Connecticut, who graduated in 1854. Mr. Henry G. Morse, the architect, who has been aided in many ways by Professor Charles F. Scott, the Professor of Electrical Engineering, has designed a building which is not only practical, but also very artistic.

The exterior architecture will be that of English Gothic, which is the same as Leet Oliver. This new building will be symmetrical to Leet Oliver in every respect possible, having same style of leaded glass windows without wooden sashes, same style of entrance, and the water tables are to be the same height. The front and a large portion of the north side will be of Indiana limestone, with common stone for all the sills and carvings. The rest of the building will be of gray brick to correspond with the limestone, except the south side. As it is expected that the building will be added to in the near future on that side, it will be finished in a cement wall.

The frontage on Hillhouse is about seventy-seven feet, and the building extends back to a depth of one hundred and seventeen

feet. The rear portion has a width of only fifty-six feet and extends nearly to Winchester Hall. Steel and concrete will be employed throughout, so as to conform with the modern standards of fireproof construction.

The main entrance to the building will be on Hillhouse Avenue and will lead to a lobby extending back about one-third of the building. Through this lobby one is able to pass from Hillhouse

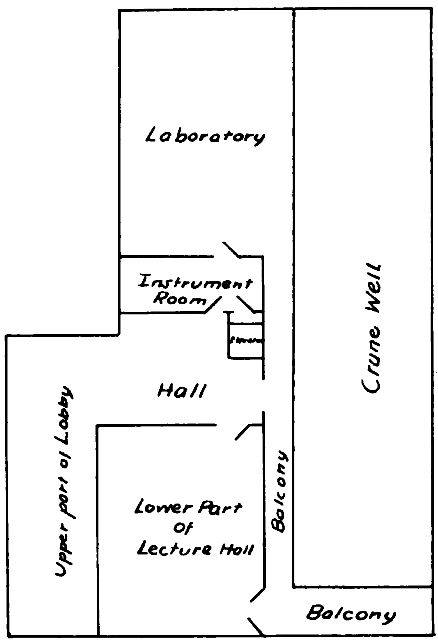



First Floor Plan

Avenue to the interior of Sheffield Square. From the lobby lead the stairways, elevator, and hallway. The hallway leads directly to the dynamo laboratory, which extends along the entire north side of the building, with a width of thirty feet and a height of twenty-five. An electric crane will traverse this room, which will have a span of twenty-nine feet and be able to receive material from a loading platform in the rear and place it anywhere in the

room. Iron rails will be embedded in the concrete floor, to which the machinery may be fastened. On the south side of this floor are five rooms: a class room, storage room, instrument room, shop, and wash room.

The second floor may be considered as a gallery to the dynamo laboratory. In the front is a large lecture room, and in the rear a laboratory and an instrument room. At the same level as this

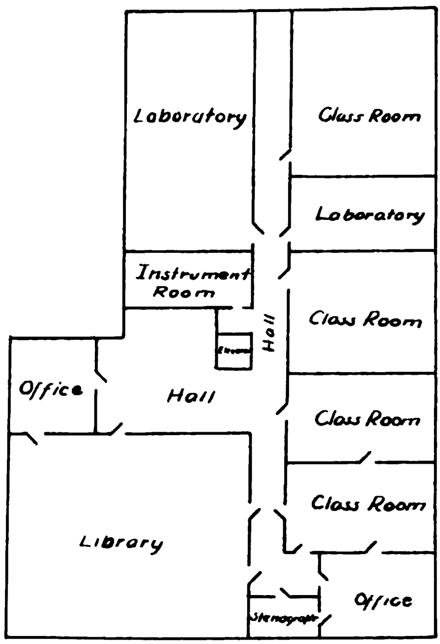



Second Floor Plan.

floor there is a balcony running the full length of the dynamo laboratory, and also extending across the front end of the room in order that apparatus may be placed upon it and then easily shifted into the lecture room or the laboratory. The lecture room will seat about two hundred people, and the seats will rise towards the back. The instrument room is in about the middle of the building, adjacent to the elevator in the front and the

laboratory in the rear. Above the second floor is a mezanine floor upon which is an entrance to the rear part of the lecture hall, and a storage battery room right above the instrument room.

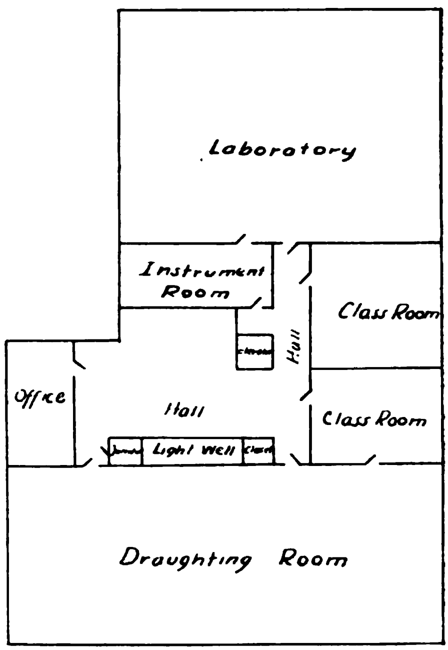
A hallway runs from front to rear and divides the third floor into two almost equal parts. Above the lecture room is a large room suitable for laboratory, but at present it will be used as an engineering reading room. It will contain all the current engi-




Third Floor Plan

neering magazines, necessary reference books, and many of the authorities on engineering. In the rear on the same side of the hallway is another instrument room and laboratory. On the other side in the front is a small office for the professor in charge, with a small stenographer's office adjoining. The rest of this floor is filled up with room of varying size suitable for research laboratories or for class room.

Across the entire front of the fourth floor and extending back about thirty-three feet, is a room which is to be used for drafting and computation. The exact equipment of this room is not known at present. In the rear is another large room, forty feet by fifty-five, which will be used for a general laboratory. There is also an instrument room which corresponds to the others in size and position, two class rooms, and a small office. Above the




Fourth Floor Plan.

office is a tower room which will be equipped for blueprint and photographic work.

The building will be heated throughout by steam and lighted by electricity. The source of the heat will be the power plant in Winchester Hall. Wires will also be carried over to Mason so that current can be received from it when desired. A very efficient ventilation system is to be installed and most rooms will

be ventilated by forced drafts, which are caused by a system of fans occupying a small room on the ground floor.

On each floor near the center of the building is an apparatus or instrument room adjacent to the elevator. These are joined by a tube lift and a speaking tube. Through these rooms passes a wire tower, which connects the switchboards in the dynamo laboratory with the switchboards on the several floors.

The walls of the halls and laboratories will be of pressed brick, either of light brick or of dark brick painted. This type of wall affords a splendid means of placing supports for wires and apparatus, by use of the expansion bolt. A very hard concrete which will not wear away to form dust, will be used for the floors.

The interior of the new Electrical Laboratory is very simple and plain, but at the same time the utility of it has never been forgotten. The electrical laboratory work of different kinds have been thought of, and facilities for each kind provided for. If one wishes to do research work or special investigation, there is provision made for such work. It might be said that the building is interchangeable, for a room at first used for a class room may at any time be changed into a laboratory, should that branch of work develop in the future.

C. GALLUER.

M. B. FLYNN.

D. MARKLE.

JOHN S. PENDLETON.

N. S. TALBOTT.

L. J. ARNOLD.

O. H. SHELDON.

# WHAT IS A TREE WORTH?

*A. Vinton Luther.*

"THE powers that be", electric light companies, corporations and the like have had a rude awakening of late to the fact that a tree has a distinct money value and that it is not a small one when they have had to dip down into their pockets (if corporations have pockets), to produce the amount of the damages calmly awarded by the judge to the common citizen.

To the tree lover who knows the benefit resulting from the presence of street trees, this apparently high commercial value is no surprise, but to most of us, it is still a cause for wonder that the value of a living city tree has been so definitely established that the courts uphold it in case after case. This value, too, is entirely separate from any consideration of how much cord wood or kindling such a tree would yield.

City tree planting has become a feature of every well-organized community. As the city presses closer and closer upon the lives of the citizens, limiting in many cases the supply of good air and even light itself, the presence of these street trees is of untold value. The citizens, before whose door a beautiful old elm has stood for years, is not conscious many times of its contribution to his health and happiness, until after it is gone. But thanks to the tree lovers who can estimate the tree at its full value, the city maple elm or oak has now legal status.

City "improvements" are responsible usually for much of the damage and destruction of the street trees. A telephone company wants to string wires and away goes the best part of a tree. Some ambitious city official suggests a change of grade in a street and down comes a row of trees that took thirty years to grow to their present beauty.

A recent report of a law-suit establishes the tree's position in New York State. "The Appelate Division of the Supreme Court has confirmed a judgment of the lower court, fixing what may be called a round value on trees in the city. A construction company, doing some work on a street, found that the trees hindered

their progress. They thereupon cut down the trees without so much as considering for one moment their value to the owner's property. Suit was at once brought against the company, the damages being laid at $500 for each tree cut down. The plaintiff recovered for the full amount as the value of the trees, and the

SHADE TREES IN NEW HAVEN.

court added $1000 more for punitive damages. It was this verdict which was carried to the Appelate Court and has been sustained."

Not a thousand miles from New Haven, a large elm stood on a village street near the home of a quiet little woman of moderate means. The village authorities decided to cut a street through, and in so doing removed the elm tree. The winter passed and

the following season the householder sued the village for the removal of the tree. It was not her tree. It stood on the public road, but she proved that the removal of it had left the house so exposed to the winds that she had to burn additional coal to make up for this. She won her case and was awarded damages. In Maine, a State Officer, a highway surveyor, while in the performance of his work cut down twenty shade trees. The adjacent property owner sued the officer and the State held him liable to the plaintiff for the destruction of the trees. In rendering the decision the Court said:

COLLEGE STREET.

"The statute encourages this method of beautifying and adorning the public throughfares. Trees so planted are a public benefit and ought to receive approval if not official care. They cannot be lawfully destroyed without a call of public necessity. Highways surveyors should protect and guard them and not wantonly destroy them."

A Kansas City telephone company had to pay $200 for cutting out the top of a shade tree, and a poplar at that. The "knights of the wire" will go a little slowly in Kansas City after this.

In North Carolina a plaintiff received a verdict of $499, although permission to cut down the tree had been received by the

Electric Light Company from the Superintendent of Streets approved by the Board of Aldermen. The case was appealed but the judgment of the Supreme Court of North Carolina was that "While the city had the power, under its charter, to control streets and sidewalks and to remove obstructions when necessary, it did not, when it condemned land for highway purposes acquire a title to the land, but merely a right of way over it, so that the plaintiff was still the owner of the land."

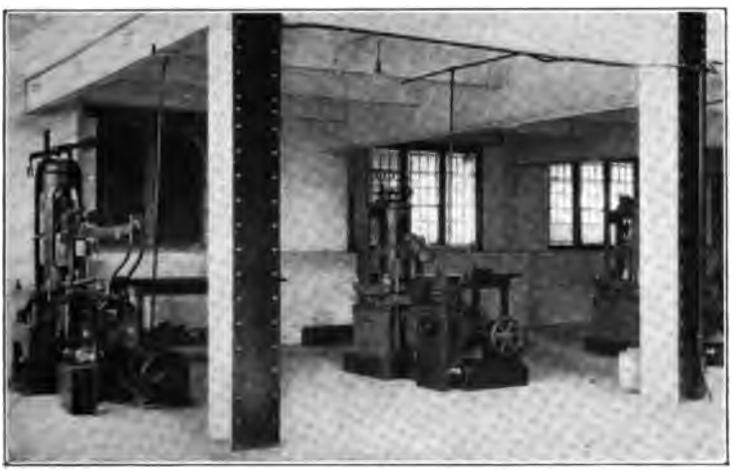
Prof. T. J. Burrill of the University of Illinois cites the following instance of the money value of trees. "Two lots on the same street were offered for sale. These lots were essentially similar in all respects save that in one case there were four trees, about twenty-five years old. Two of these trees were in the street, and two in the lot inside the street. In the case of the other lot, the only trees (two of them) were on the street, and these were less than half the age of the others. The prices asked for the lots were respectively $2,500 and $1,500. A man wishing to build compared the two lots and decided in favor of the $2,500 one, the lot namely with the four trees. $1,000 for four trees, or, we might say, two trees."

The Shade Tree Commission of Newark, New Jersey, has won case after case where shade trees were injured or cut down unnecessarily. Some of their best work has been in following up the instances of trees killed by illuminating gas and the securing of ample damages from the Public Service Corporation covering the removal of the dead tree, the entire root system and the gas-filled soil, the replacing by fresh soil, the planting of new trees and the placing of stakes and guards. The Gas Company must bear the entire expense of this.

This well organized Shade Tree Commission of Newark does not rest with winning out on its law cases but does an immense amount of constructive work in educating the people up to higher ideals, tree-ward. When the practice of the ice-cream dealers in emptying salt water in the open space around the trees threatened to kill them, this Commission issued a leaflet in four different languages and distributed one to each dealer in the city. Bulletins, directions to tree-planters and literature of various kinds are sent out to keep the people in touch with the move-

ment to "make the city awave with trees," the motto on the seal of the Commission. A tree league was organized among the children, the first and largest of its kind. The record of one especially hot dry summer where the children watered the street trees nearest them giving a total of 9388 waterings more than justified the existence of this tree league.

The city tree is coming to its own and making a record for itself in the courts of justice. With an established position in the community, it no longer asks for the citizen's tolerance but commands his respect for its contribution to the city's welfare.



A CORNER IN THE MASON LABORATORY OF MECHANICAL ENGINEERING.

## TRAMPS

*A. F. Blake.*

THERE is a certain type of individual who pursues with as much diligence the business of doing nothing as the average man, who attempts to earn a living, pursues his profession or trade, These so-called tramps are very numerous in our country; it being estimated that there are about 350,000 altogether. The tramps are of various kinds, some more objectionable than others There is one class that is willing to work and does work. These men wander from place to place working for various lengths of time at each stop. They help to harvest our wheat crops in the middle west, and a little later they are in California picking fruit. There is no particular objections to such tramps. Others, forced by pressure of circumstances, drift into the tramps' form of life involuntarily. These are, for the most part, men thrown out of employment, either on account of hard times or their own incompetence. They are usually willing to work when they get a chance, though often, after having had a taste of the tramps' life they become professionals. The third class, the professional tramp, is by far the most interesting as well as the most dangerous to society. This class is composed of men who apparently were born with a natural aversion for work. They are bound together in an organization much more close knit than is generally supposed. They have customs peculiar to themselves, numerous unwritten laws which they all observe, and they even have a vernacular of their own which is almost unintelligible to an outsider.

When we see one of these wretched specimens of humanity on the road, we do not ordinarily regard his lot as a very happy one. Yet he has usually chosen it for himself and judging from the numbers who live in this manner there must be some features of the "hobo's" existence that appeal to his depraved tastes. He avoids the monotony of life. He travels around and sees the country. He has no fixed routine. And then he avoids the conventionalities which oppress the civilized members of society. His wardrobe does not require much time and attention. The

value of good clothes is not appreciated by his associates. The vexations incidental to barber shops, laundries, and shoe shine parlors are unknown to him. He travels in empty freight cars, "side door Pullmans" as he calls them. Of course he is sometimes unceremoniously ejected, but what of that? We all have to wait for trains occasionally and after we have paid for a ticket, too. In camps outside the cities, he finds others like himself. Though not polished gentlemen he finds them congenial acquaintances. Their conversation is perhaps not on a high plane, yet it is at least interesting. These bands wander around, supplying their meager wants by petty thefts or by imposing upon the charitable dispositions of some people.

So much for the joys of the tramp's life. He certainly has his troubles too. There always looms before him the probability of arrest with subsequent confinement or worse yet, work, an unendurable affliction for him. The mortality rates among tramps give conclusive evidence that their lot is not easy. Exposure to all kinds of weather and their liability to accident makes long life a rarity. It is estimated that fifteen or twenty thousand tramps were killed on the railroads of the country in the year 1901. Their habitual intemperance and disregard of the laws of hygiene swell the death list also.

Their ranks, however, are continually recruited. Some naturally take to this kind of life. Many come from the ranks of the unemployed. To a great extent, the professional tramp does his own recruiting and herein lies one of the worst evils due to tramps. Each one aims to secure at least one boy to act as a sort of valet to him, someone whom he can bully and who will minister to his comfort. Small boys are either forcibly kidnapped or else lured away from home by stories of adventure on the road, lemonade springs, rock candy mines, etc. These boys, whom they have picked upon around the freight yards, are taught to steal and beg. Often they become very proficient and net their masters much profit. Sometimes their bodies are purposely mutilated so that they can appeal to people's sympathies with tales of industrial accidents. If the boy does not take to his new environment or is inclined to rebel against the tramp's treatment,

he is lost at some convenient place and sometimes beaten to death or thrown from moving trains.

Tramps are closely allied and well organized. Tramp conventions are frequently held at which tramps gather from all parts of the country. A large and noted convention was held in the eastern part of the Province of Montreal about thirteen years ago. Green Island, Iowa, in the Mississippi River is a favorite meeting place. Sometimes four or five thousand are present at one time. It is reported that at one such gathering seventeen wagon loads of beer were consumed in one day.

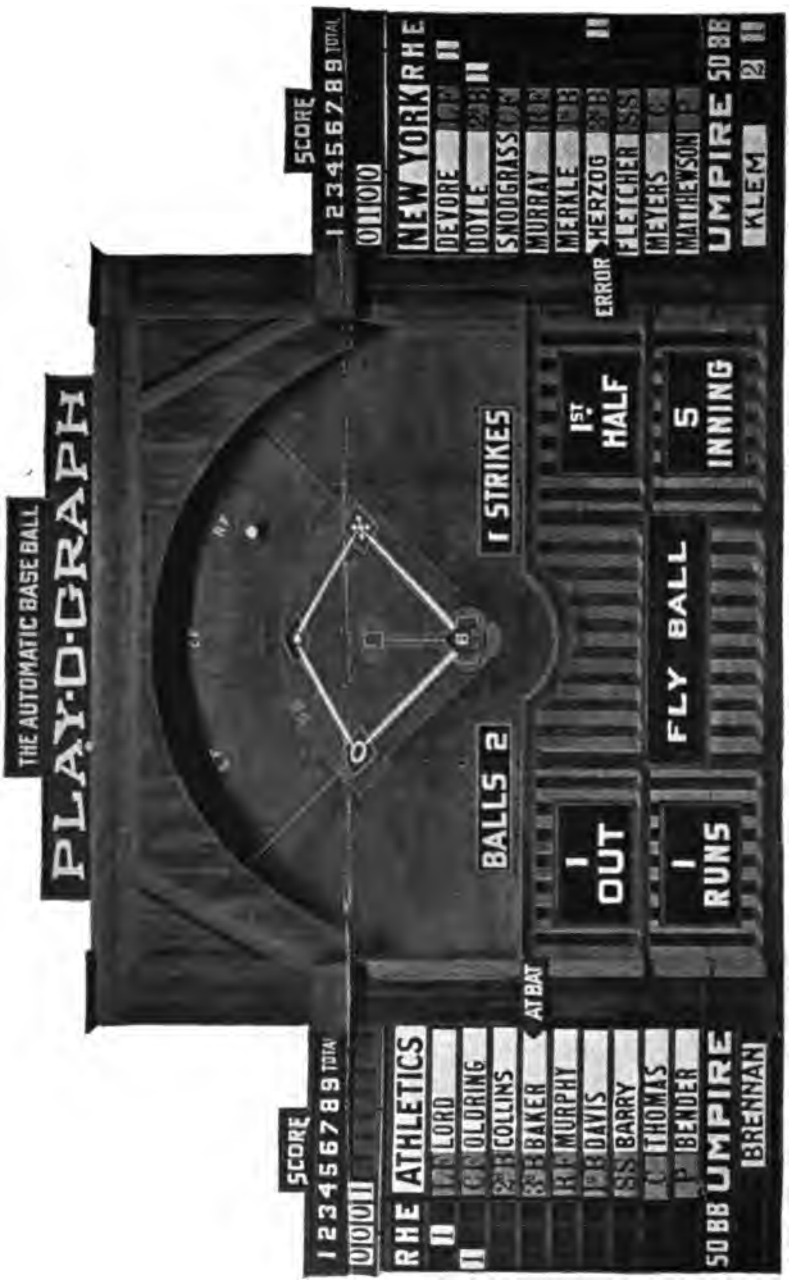
The tramp problem is one of the most important before the American people to-day. One solution which seems feasible has been suggested and is now being tried. Tramp farms are being established. In New York State a law has been passed providing for the maintenance of such farms. Seven managers have been appointed to push the project through. The law states that these farm colonies are "for the detention, humane discipline, instruction and reformation" of the tramp. The last word might as well have been omitted. An examination of the records on the subject of five continents for six thousand years has failed to reveal a single properly authenticated case of a reform mendicant. However it is hoped that they may be able to make him work a little and at least keep him off the roads and park benches, out of police cells and away from places where he is an unceasing nuisance. It is hoped that the tramps can be made to work enough on these abandoned farms to pay their keep. Tramp farms will probably never become money making institutions, but they certainly will not cost the State of New York the two million dollars a year which is the estimated cost of the tramp under present circumstances. We all hope that either these tramp farms or something else may prove successful in lessening this public nuisance and danger.

# THE AUTOMATIC BASEBALL PLAYOGRAPH

*J. Hunt.*

DURING the recent World's Championship Baseball Series, the eyes of the American people were centered on one of two baseball diamonds, one at New York and the other at Boston. Of course only an extremely small percentage of those interested were able to see the games personally, but by an ingenious invention called the Playograph, many thousands were enabled to see an exact reproduction of the games even to the minutest details. Each day of the series, in cities all over the country, loyal fans alternately cheered and groaned, clapped and hissed, as the rival teams, many miles away, fought out the championship. It is an illustration of the grip of athletic sports upon the American people that thousands of people repeatedly cheered a pitcher, in some cases thousands of miles away, when he got a strike over, or on the contrary by hoots and yells tried to rattle a pitcher on the "other" team.

This extremely ingenious invention is made by the Baseball Playograph Company of Stamford, Conn. On a vertical board is painted an exact reproduction of a baseball diamond. At first, second, and third bases, and at home plate, are slots in which appear, when necessary, a cross which signifies that the runner is safe, or an O which denotes that the man has been put out. By the audience a white ball is seen which moves rapidly over the field exactly as in a real game. For instance, the ball remains stationary in the pitcher's box until the pitcher is ready to throw it, when it shoots down towards the plate, in a straight line, or a curve, as may be desired. If the ball pitched is a ball or a strike, it goes past the home plate to the catcher's box, and opposite the painted words "Balls," or "Strikes" appears a number telling the number of balls or strikes on the man If the ball is hit, it shoots out to wherever it is actually hit and in a slot provided for the purpose appears "Fly Ball", "Fouled Out", or whatever happened. If the man is safe, in the slots at the bases appears a cross; if put out, a large O. If there is a fumble, a pointer inscribed "Fum-




THE AUTOMATIC BASEBALL PLAYOGRAPH.

ble" runs down the lineup of the players which is placed on each side of the field and indicates who made it. In short, the Playograph shows every possible play, including Strikes, Balls, Outs, Runs, Singles, Two or Three Base Hits, Home Runs, Bunts, Passed Balls, Wild Throws, Muffed Balls, Fumbles, Strike Outs, Bases on Balls, Grounders, Fly Balls, Fouls, Errors, Batting Order, Batter Up, the Inning and the Half-Inning, Score by Innings, Hits, Runs, and Errors of all Individual Players, and Bases showing runner Safe, Out, On, or Off Base. Of course the above description is by no means complete, but it serves to make clear the large field of plays which the Playograph covers.

All of the above is already known to almost all who are interested in baseball, but there are comparatively few who understand how the machine is operated. The operation of a Playograph requires two men, in addition to the telegraph operator who receives the plays over the wire. One of these men operates the ball, while the other works the keyboard, which manipulates all the other parts of the invention. The ball is worked in a comparatively simple way, once the operation is understood. On the back of the board, "behind the scenes," as it were, there is a perpendicular stick, one end of which is fastened to the floor. On this stick is a cross handle by which the ball is moved up and down by means of a thin and almost invisible string which is fastened to the ball above and below and similarly to the handle on the back. Thus it will readily be seen that by moving this handle up or down the ball will move down or up as the case may be. However this would only permit the ball to move straight up or down between the catcher's box and center field. The perpendicular stick is, while fastened at the bottom, loose at the top and free to move in a groove to the right or left. Now by a combination of these two movements the ball may be made to move anywhere on the board. Of course anyone could not go up and immediately work the ball, but by practice one may become very adept at it. For instance, while representing a throw from the pitcher's box to home plate, by a slight and quick movement of the perpendicular bar, an excellent curve may be represented.

As stated above, there is a slot at each of the bases, where symbols appear to show whether a man is out or safe. At the back of the board is a sort of keyboard. Each key works a different symbol for a different place. For example there is a separate key for each safe or out sign at each base and home plate, and also a separate key for each of the signs which appear below the diamond in a slot provided for them. These signs state "Flied Out", "Fouled Out", "2 Base Hit", etc. Besides the keyboard, on each side of the lineup is a pointer, one of which says "Error", and the other "Batter Up". By a manipulation of these pointers, the keyboard, and the ball, each and every play may be faithfully reproduced.

## REPLACING NEW HAVEN ELMS

*C. W. Smith.*

THROUGHOUT the latter part of its history, New Haven has been noted for its beautiful old elms. This fall these elms are being cut down, and no sign of their replacement has been made in the majority of cases. They would, of course, have to be replaced by small trees which would not be full grown for a number of years. A few elms have been removed from the rows lining Hillhouse avenue and quite a number from College Street, and the places left vacant have only been covered over with soil, leaving unsightly bare places in the rows of trees. However, beside the Bicentennial buildings, there are several small trees which have been set in recently, but this is the only place where the actual realization of the object has been attained. On Temple Street, between Grove and Wall Streets, preparations have been made for the installation of elm saplings. This row will border the future Sheff dormitories, and ought to be of formidable size when these buildings are erected and completed. It seems that this work could be carried on with more signs of advance. Of course, the expense of completing such a project is great, yet at the same time, the appearance of the streets of a city bear an untold amount of importance on the impressions conveyed to visitors.

# HISTORICAL SPOTS IN AND ABOUT NEW HAVEN

*W. F. McLean.*

WE are surrounded here at Yale by a wealth of historical objects, about which most of us know little or nothing at all. Those who come from outside of New England have no doubt had a desire to see the places which have become famous since early colonial and Revolutionary times. Right now, during our life at New Haven, we are offered a splendid opportunity of seeing many of these very places about which we have studied

WEST ROCK.

in history, for several of them are within a short walking distance of the College. We should not be blind to the fact that we are daily passing historical spots, to see which, hundreds of Americans come every year from all parts of the country. Some of the college buildings themselves are old colonial mansions.

South Sheffield Hall stands on the site where the English held a guard-house in which many New Haven loyalists were imprisoned. When the British invaded New Haven on July the fifth, 1789, they arrived off Savin Rock shore in forty-eight ships. In their advance upon the town they were met at West Bridge by

Captain Bradley with a small company, who repulsed them and forced them to try another route into the city. A monument at the end of Congress Avenue now marks the spot of the battle of West Bridge. The British were repeatedly attacked by a skirmishing party commanded by ex-President Dagget of Yale. They finally entered by way of Whalley Avenue and at the corner of Whalley Avenue and Broadway a fierce fight took place. The British then swept York Street with their guns, whereupon they marched past the Campus to the Green, and from there ransacked the town. If it had not been for the fact that an English officer

THE DEFENDERS.

MONUMENT MARKING THE SPOT WHERE THE BRITISH WERE REPULSED.

thought the city too beautiful to be burned, the soldiers would have laid it in ashes. Fort Hale, which lies on the east shore of the harbor on the way out to the Lighthouse, was built in 1774-5, when the Colony was in terror of British invasion.

On the corner of Meadow and George Streets there stands an old inn where George Washington stopped on his way through New Haven. Mementos of many other interesting events are to be found about the town. Until six years ago Benedict Arnold's house stood on Water Street, close to Union Street, on a spot

now marked by a tablet. In the attic of this old house was a hiding place where Arnold kept his smuggled goods, for everyone smuggled in those days. At the time when the house was demolished one could still see, in the cellar, the ovens and wine cellar and the ruins of what was once a tunnel that connected the house with the wharf, through which smuggled goods were carried. Noah Webster lived in the same house later, and began there his dictionary. Over by Lake Whitney, at the end of Whitney Avenue, is the old factory in which Eli Whitney began the manufacture of rifles for use in the Revolution. This was the beginning of the prosperous Winchester Arms Company.

JUDGES' CAVE ON WEST ROCK.

Earlier Colonial times also furnish us with objects of interest. The case of the Regicides, which stirred all England, was carried over to America by the flight of William Goffe, Edward Whalley, and John Dixwell to this country. These men had sat on the judgment seat over Charles the First when he was condemned to death, and a price was set on their heads by Charles the Second. To escape death they fled to the New Haven Colony for protection. While Goffe and Whalley concealed themselves in out-of-the-way places, John Dixwell lived in New Haven under an assumed name until he died. The former two hid for some time in a cave on the top of West Rock, where they were fed by a

near-by farmer. The remains of Judges' Cave, as it is now called, may still be seen on West Rock, and the marks where the fugitives cut the calendar days in the rock wall are visible to this day.

Closely linked with this old colonial history is the story of the commercial progress of our country. An example of our advance from slow methods of transportation to rapid ones is to be seen in the railroad which now passes by Leet Oliver Memorial Hall. The tracks of this road lie in the bed of the old Farmington Canal, which was first opened to boats in 1828. It then extended as far as Cheshire and Farmington, but in 1835 boats were able to pass through Northampton into the Connecticut River. The canal was abandoned in 1847 and its bed has since been used for the railroad, which now is a direct route from New Haven to Northampton.

In the building occupied by the New Haven Colony Historical Society on Grove Street there are numerous relics of interest. Benedict Arnold's old drug store sign hangs there, along with pictures of New Haven in early times, portraits of notable characters in Colonial history, Indian relics, products of early American manufacturers, and countless things which we would do well to see. This building is open to the public during most of the day and more of us should take advantage of the splendid opportunity afforded us of freshening in our minds the deeds of our ancestors.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## THE YALE LOCK

*A. H. Soler.*

THE Yale lock is, at the present date, the safest lock in the world for its size. It was invented over fifty years ago by Mr. Linus Yale, Jr., whose early ancestors were of the same family as the founders of the University.

Prior to the invention of the Yale Lork, the round key was in universal use; its size was usually proportionate to the size of the lock, and, of necessity its length was proportionate to the thickness of the door. The weight and bulk of a bunch of keys of that day can hardly be realized.

The main differences of the Yale lock from the regular door locks of today are that it removes the key mechanism of the lock from the case which contains the bolt, and encloses it in a separate "cylinder" inserted from the face of the door and permanently connected with the lock case behind; it combines the ancient Egyptian "pin-tumblers" with a revolving "plug" containing the key-way, which not only gives greater security but also a far greater capacity for key changes than any other system; it combines a flat key with the plug so as to remedy the bulk of the usual lot of door keys.

The first and most important element of the Yale lock is the cylinder. It consists of a shell, or case, enclosing a revolving plug and containing a pin-tumbler, with their complementary drivers and springs. Extending longitudinally through the plug is the key-way and attached to its inner or rear end is the cam, which, when the plug is rotated, engages with and operates the bolt of the lock.

Each pin-chamber is formed partly in the cylinder and partly in the plug, and each contains at its bottom a pin (on which the key acts). Above this, another pin, called the driver, and above the latter a spring. Normally, the pins rest at the bottom of their respective pin chambers, which later intersect the key-way but do not extend quite to its lower limit. In this condition the plug is barred against rotation by the drivers, each of which rests partly in the plug and partly in the cylinder.

When a key is inserted, its point passes under the pins, successively, and raises them so that they rest on top of the key. The insertion of the true key lifts each pin to a point such that the point between it and its driver corresponds exactly with the point between the plug and the cylinder. The plug is now free to rotate within the cylinder, the pins traveling with the plug and the drivers remaining stationary in their respective chambers. If any but the true key be inserted, however, the pins will not be lifted to the proper points, and the plug will still be barred against rotation. As the number of the pin-tumblers is usually five, and as a variation of one-fiftieth of an inch from the proper height will cause any tumbler effectively to prevent rotation of the plug, the Yale lock is given a high order of security and a vast capacity for key changes or combinations.

The invention of the rotating plug with its contained pin-tumblers, carried with it and made possible the employment of a flat but rotative key.

At first the keys were flat with a trefoil form of handle, but gradually this has been changed to the present method of corrugating the blade of the key. This not only makes the blade stronger but also makes it more difficult to duplicate the key. The corrugations of the key approach, but do not pass, the axial line of the key-way. Yet even this key had its disadvantages as the lock could be picked by experts, using picking tools of great delicacy.

This difficulty led to a great series of tests to determine on the improvement necessary to remedy the defect and led directly to the development and adoption, about 1892, of the type of key now used with all of the genuine Yale locks. These keys were called the Yale Paracentric Keys. The principle consists in constructing the key-way with continuous longitudinal barriers

(in planes perpendicular to the motion of the pin-tumblers), projecting from opposite sides of the key-way past its centre, or axial line, and interlocking so deeply as practically to preclude the use of picking instruments to operate vertically on the tumblers. The key itself naturally coincides accurately with the cross section of its key-way.

The three main changes in the Yale locks have given them three absolutely different forms so that no key of one set will open a lock in another set. However, it is not true, as is commonly supposed, that no two Yale locks have keys alike. The number of changes of a common inside door lock is usually four, although some will run up as high as thirty-six. In the case of the Yale lock, in its standard form, the number of key-changes theoretically possible is 100,000, but practically this is reduced, by throwing out keys of undersirable form or those too nearly similar to 27,000. The hangers thus selected for use are recorded in printed lists, and the latter are carefully followed in manipulating the machines which produce the keys, so that the entire series is used before any of the changes are repeated, but it is obvious that there is a chance, in the ratio of 1 to 27,000, that the keys of two Yale locks may interchange.

# DURIRON

*L. F. Harder.*

PROBABLY the most important acquisition to the scientific world within the past few months has been the discovery of a new metal, Duriron. This metal has proved itself to be worthy of more than passing notice and should be especially interesting to

CONCENTRATING POT.

Sheff men because it was mainly due to the efforts of Peirce D. Schenck, '00S, that the metal has been discovered.

Duriron is silver gray in color, has a specific gravity of 6.5, being, therefore, from ten to twelve per cent lighter than cast iron.

It is more brittle than cast iron and results obtained from the Shore test show it to be from 1½ to 2 times as hard. Owing to this extreme hardness, Duriron cannot be machined. This apparently serious objection has been surmounted by grinding it in especially designed machines. On account of patents which

SPECIAL PIPE FITTINGS.

are still pending, the composition and method of casting cannot yet be announced to the public. Duriron when cast shrinks 3-16 of an inch to the foot, making difficult the casting of large plane surfaces. This difficulty has been overcome by secret methods in casting and also by slightly rounding the plane surfaces, a

radius of eight feet having been found sufficient to make a good casting. Duriron has a tensile strength of 15,000 pounds per square inch and a compression strength of 70,000 pounds per square inch, and it melts at 2550° F. Duriron is also a good conductor of electricity.

The most interesting and remarkable properties of this new metal are its indifference to the action of acids and alkalis. This characteristic of the metal is shown by experiments recently made by a prominent New York chemist, in which pieces of Duriron, cast iron, wrought iron, Tobin bronze and Monel metal, having

AN ACID COCK.

surfaces as near equal in area as possible, were treated with various solutions of acids and alkalis. In a cold solution of nitric acid, 25% chemically pure, Duriron lost four thousandths (latest report) of one per cent after an immersion lasting eight weeks. Monel metal, its nearest competitor, lost 94.06% in an immersion of the same duration, while Tobin bronze dissolved completely in seven and one-half days, wrought iron in fifty-eight hours, and cast iron in sixty-three hours. In another experiment using hydrochloric acid and the same metals, Duriron lost one-half of 1 per cent by dissolution in four weeks, Monel metal lost 7%, and wrought iron lost 69%, and cast iron dissolved completely in ninety-seven hours. Similar experiments with other acids gave corresponding results. Duriron placed in solutions of

ammonium chloride, sodium chloride, calcium chloride and cyanide showed no appreciable dissolution. Most important of all the chemical tests is the one with 25% sulphuric acid, cold. In this test Duriron showed absolutely no loss after twelve weeks immersion, whereas cast iron was completely dissolved in sixteen days, and wrought iron in thirty days. These rare properties of Duriron make the metal invaluable to manufacturers of acids, chemicals, drugs, explosives, colors, fertilizers, etc.

The first application of this metal to practical use has been in the manufacture of acid cocks, pipes and fittings, which demand a metal which can resist the attack of the acids. Acid cocks made from other metals cannot be left at rest for more than a few hours at a time, even in strong acids, without giving trouble in turning. It is often necessary to take these ordinary cocks apart and clean them in order to have them work at all. One difficulty encountered in the use of Duriron for acid cocks was the likelihood of breakage due to buckling and twisting strains that occur in long pipe lines. This difficulty has been overcome by rigidly clamping a light malleable iron cradle around the valve as is shown in the illustration. Duriron cocks, however, may be left for months and still turn easily because of the very slight action of acids on the ground surfaces. The value of acid cocks made from Duriron metal lies in their long service and freedom from sticking.

An acid centrifugal pump is now being made by shrinking a Duriron wheel on a steel driving shaft. Other uses to which this metal is now being adapted are concentration pans for acids, stirrers, towers, flues, nozzles, strainers, blowers and cathodes.

After a long series of experiments the manufacturers have discovered how to weld Duriron with the oxy-acetlyline flame, so that the weld is as strong as the original casting, and furthermore has the same acid resisting properties. This discovery will be of great value.

Considering the fact that Duriron, as a composition, is not yet a year old, it is remarkable what progress has been made. Duriron seems to be exactly the metal we have been badly in need of for a long time. Its hardness, lightness and resistance towards acids rank it among the most remarkable of compositions.

# PRESENT CONDITION AND PROBABLE LINES OF DEVELOPMENT OF THE WIRELESS TELEPHONE

*John W. Shallenberger.*

THE position of wireless telephony in electrical progress is that of an intermediate step between wireless telegraphy and the long-sought-for wireless communication of power. In attempting to perfect the wireless telephone and hence discover some means of transmitting power by Hertzian waves, inventors have heretofore worked along only a few lines. At present the former rapid development has come to an abrupt stop. Inventors seem to have reached their limit; they seem to have exhausted the possibilities of their few lines of operation and to be unable to open up new lines.

This cessation of activity is unfortunate, as it prevents the wireless telephone from attaining that stage of perfection necessary for it to become of practical use. When telephony without wires has been made practical, it will find many uses under conditions which make wire instruments either impractical or inefficient. As soon as the wireless telephone can cover long distances successfully, it will supplant the long distance telephone, especially where for any reason wires or cables are too expensive to install and maintain. On account of the superiority of the telephone over the telegraph in the fact that brevity is not essential, the wireless telephone will be used by ships of the navy and merchant marine in place of the wireless telegraph now in service. The distortion of the voice waves, to which are due the harsh, rasping noises so noticeable in all long-distance telephone communication, would be entirely done away with by the use of the wireless instrument. The reason is that the Hertzian (or ether) waves are wholly unaffected by the distance through which the message is sent; on the other hand, the uneven distribution of the current in long-distance wires causes the described effect. Since it is the wires that cause the trouble, it has been stated that trans-Atlantic telephony would be impossible; but with the removal of the cause of annoyance, it seems perfectly possible

that the wireless telephone may some day be a means of intercontinental communication.

There are three general methods of wireless telephony now in use: conduction, low-frequency induction, and high-frequency radiation. Conduction methods depend upon small currents which will flow through the earth from one grounded conductor to another, and are of no use except for very short distances. Low frequency induction instruments will give good results only up to a hundred feet. Even for this short distance this method is impractical, on account of the great waste of energy. Therefore the only methods which are at all desirable for long-distance wireless work are those employing high frequency radiation. The underlying principle of these methods is practically the same as that made use of in wireless telegraphy, the only difference being in the method of exciting the vibrations of the ether. A nearly continuous alternating current of very high frequency passes through a transmitter, which modifies the current according to the voice vibrations. The energy of the modified current is transmitted to an aerial radiating system (similar to wireless telegraph aerials) and from there travels through the ether in the form of Hertzian waves. These waves produce a feeble current in the receiving aerials and its vibrations are again transformed into speech vibrations by a receiving apparatus. The wave telephones now in use employ either arcs or alternators for the generation of the high frequency current, and are said to belong to the arc or alternator class according to which one is used. Both, however, make use of some form of microphone for the transmitting and receiving apparatus.

Many attempts have been made to perfect a wireless telephone system which would be practical, but so far all have failed. The earlier experiments with conduction and low-frequency apparatus accomplished nothing that could not have been done with wire instruments. Apparatus using high-frequency currents have given some good results, but never with enough regularity to be of practical advantage. Fessenden has been responsible for some of the most important experiments yet made. Using a continuous high-frequency current giving forty thousand vibrations per second, generated by an alternator designed especially

for the purpose, he established communications between Brant Rock and Plymouth, Massachusetts, a distance of twelve miles. In this case the enunciation of the wireless was distinctly better than that of the wire telephone connecting the same points. In another set of experiments between Brant Rock and Jamaica, Long Island, two hundred miles apart, in which Fessenden's apparatus was also used, reliable communication is said to have been established, but as the Jamaica station was dismantled soon after the trials, the reports could not be verified.

Nearly all experimenters other than Fessenden have used the arc type of apparatus. The distances through which it is possible to send messages by this apparatus are small compared with those covered by Fessenden. The greatest distance attained by those using this method in this country was between the naval stations at Brooklyn and Fire Island, a distance of about fifty miles, with apparatus manufactured by the Telefunken Company of Germany. In this case the articulation was not good because of the overloading of the transmitter in order to give enough power to cover the required distance. The Eiffel Tower has been a prominent factor in the achievements of the French in wireless telephony, for it has been reported that De Forest has made from there some excellent records (distances of a hundred miles and over), and Jeance and Colin, of the French navy, have done good work when using the tower wireless antennæ with their transmitters. They have also covered the distance between Toulon and Port Vendres, a hundred and fifty miles. If any of these feats could be repeated with any degree of accuracy whenever desired, they would be of great value. As it is, however, they may be considered as only the coincidence of a number of very favorable conditions.

After considering briefly the apparatus used and the field covered at the present time in wireless telephony, the question of why nothing more has been done arises. The answer to this is to be found, not in a decreased activity on the part of the inventors, but in the fact that they continue to work in the same lines, attempting to improve the apparatus already in use. This apparatus has its limitations and these limitations seem to have been reached. Losses of current through the ground bar the conduc-

tion method. In the induction, or low-frequency method, the distance covered varies as the current in the induction coil of the transmitter; this current must be modified by passing through a microphone, which at present has a very low current-carrying capacity. Thus the maximum distance through which the induction method may be used is small. The wave method is the best so far proposed, but both types using this method have their limits. The distance over which satisfactory results may be obtained depends of course on the effective energy radiated, and no more energy may be radiated than may be reliably controlled by the voice. Since the voice can control no greater current than can be handled by the microphone transmitter, the success of wireless telephony depends a great deal upon the perfection of the microphone transmitters and receivers. Moreover, in order to obtain the highest effeciency, oscillators are necessary which will give higher rates of vibration than the arc can furnish, as it has been found by experience that the limit of its power has been reached. The infrequent use of the alternator type of oscillator furnished very little material for judging its possibilities, but the great cost of its design and construction makes it quite impractical at present.

It is quite evident, then, that future systems of wireless telephony must either eliminate the microphone transmitter and receiver, or find types which will far excel those in use at present. Moreover, a more powerful and reliable oscillator will have to be found to take the place of the arc. If the cost of its construction and maintenance can be reduced sufficiently, this substitute may be the alternator. With these weak points eliminated the wireless telephone should become of great commercial value, but until they are eliminated, either by improving the present apparatus, or, as seems more probable, by developing new methods and apparatus, the attempts at perfecting the wireless telephone will be futile.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

*Microbes and Toxins.* By Dr. Etienne Burnet, Pasteur Institute, Paris. English translation with 71 illustrations and 316 pages. Published by G. P. Putnam's Sons, New York. Net $2.00.

In an admirable introduction by Prof. Elie Metchnikoff is given a brief history of the progress of microbiology, in which Pasteur and his pupils have taken no small part. Among other important statements the following is of special interest: "It is time for bacteriological science to leave the laboratory and the lecture theatre, and to take its place before the great public, in order that its benefits may receive the widest and readiest application."

The book is divided into fifteen chapters as follows: The general functions of microbes; microbes in the human body; form and structure of microbes; physiology of microbes; pathogenic microbes and infection; inflammation and phagocytosis; the pathogenic protoza; toxins; tuberculin and mallein; immunity; anaphylaxis; application of bacteriology; vaccines and blood sera, and chemical remedies.

The progress which has been made in the last 20 years in the science of bacteriology and general microbiology is well portrayed. The rapid advances which have been made in the study of bacterial toxins, vaccines, antitoxines, etc., also come in for a large share of the discussion. Some of the chapters are unique in that they embody so much information that has been acquired through the researches of the Pasteur Institute.

In the chapter on microbes in the human body is found a comprehensive discussion of bacteria in man and the possibility of

life without bacteria. The body immediately after birth is beset by many kinds of microbes. Pasteur expressed the opinion that life without bacteria is impossible. There are two views, however, which are opposed to each other, and it will require much experimentation to settle the question. The author appears to favor the view of Pasteur. The possible relationship of certain bacteria and their toxins in old age in man, and the possibility of eliminating their evil influence are dealt with.

The application of bacteriology to preventive and curative medicine, and the employment of chemical remedies, also receive much attention. In fact the entire book abounds in most valuable information, and is written in such a way that it may be read with understanding by the general reader. While the discussions are not strictly popular, they are far from being professionally technical.

The book is provided with a complete index and a glossary of terms used in the text. Three photographs also accompany it, namely those of Pasteur, Metchnikoff, and the author.

LEO F. RETTGER.

*Hydraulics.* By Hector J. Hughes, and Arthur T. Safford. The Macmillan Company, New York, publishers. Price, $3.75 net.

In a science so comparatively young as that of Hydraulics and, therefore, one in which comparatively few books of any real value are as yet extant, such a book as the one under consideration will undoubtedly be welcomed both by engineers and teachers. It is a significant fact, also, that in all the great technical schools to-day, a practical knowledge of the principles of Hydraulics is required before an engineering degree of almost any sort is given, so that the field of usefulness open to a good book on this subject is a large one. And not only is it a large one now but one that is constantly increasing in size with the gradual advance in the price of coal and the consequent falling

back upon our rivers, etc., for a source of the huge quantity of power, light, and heat consumed in this country every day.

The book is written as a text book for technical schools and colleges and contains all the fundamental principles of Hydraulics, including water pressure, the stability of simple structures submitted to water pressure, the flow of water, the measurement of flow and the fundamental principles of hydraulic motors. Such subjects as the design of hydraulic machinery and water power plants are very wisely omitted entirely as being too important for a merely passing remark and far too extensive to be properly treated in this one volume.

The authors have tried to explain as simply as possible the best methods of solving hydraulic problems, together with the empirical coefficients and formulæ used in connection with them, pointing out when possible the exact limitations of usefulness to which these coefficients, etc., are subject. Along with these are considered the difficulties that arise in practice and how to meet them, thus making each subdivision of the subject complete as it is taken up. This arrangement is very helpful in using the book for reference.

It has, altogether, about five hundred pages, including in the back of the book some very useful tables and diagrams of suitable precision and extent, among which is to be found an extended study of pipe experiments. All these tend to very materially shorten the time demanded by the otherwise tedious processes so often involved in hydraulic computations.

The book is, in short, an excellent treatise, fulfilling well the object for which it has been written. The subjects treated include all those necessary for a thorough understanding and working knowledge of the principles of Hydraulics, and each subject is as clearly presented as possible, so that with the aid of the many explanatory diagrams and drawings any student of average intel-

ligence and a firm grounding in mathematics should be able to grasp the principles involved.

LUCIAN PLATT.

THE YALE SCIENTIFIC MONTHLY wishes to acknowledge the receipt of the following books, which will be reviewed at the earlist opportunity:

*Elementary Textbook on the Calculus.* By V. Snyder and J. I. Hutchinson. American Book Co. $2.20 net.

*Descriptive Astronomy.* By F. R. Moulton. Chicago American School of Correspondence.

*Theories of Solutions.* By Svante Arrhenius. The Yale University Press. $2.25 net.

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'82—E. L. Whittemore, Class Secretary, is now in business at 7706 Platt Avenue, S. E., Cleveland, Ohio.

'86—J. R. Hickox is now working for the C. B. & A. R. R. and is living in Lincoln, Nebraska.

'89—H. M. Verrill is now with Messrs. Hale & Booth as Attorneys and Counsellors at Law, Portland, Maine.

'91—Benedict Crowell is at present affiliated with the firm of Crowell & Murray, with offices in the Perry-Payne Building, Cleveland, Ohio

'95—Lloyd W. Smith, a member of the first Board of the YALE SCIENTIFIC MONTHLY, is now in business with Harris, Forbes & Co., Pine Street, corner William, New York City.

JANUARY, 1913



# The Yale Scientific Monthly

VOL. XIX

No. 5

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. JANUARY, 1913. No. 5

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. JANUARY, 1913. No. 5

## EDITOR'S NOTES.

### THE CO-OPERATIVE COUNCIL

FOR the past few years, in view of the fact of the growing representation and prominence of the Sheffield Scientific School in the University affairs, the need has been felt for some body in which matters concerning the University at large could be discussed by a representative body of the two large departments. At the suggestion of the Academic Council and that of Sheff this body was called for the first time this year under the name of The Coöperative Council. In this body all matters of importance to Yale are discussed, matters beyond the scope of the Councils of the two departments. This Council has no power to act on any suggestion other than to see that the measure is discussed and acted upon in the next meeting of the respective Councils.

It is felt that this informal body can exert a vast amount of influence on University affairs, especially in those things which in any way can cement the two departments together so that in time we won't have "Sheff" and "Ac", but the one word, Yale, a thing which each and every person in the University should strive for by action and example.

## THE VACATION

UNDERGRADUATE opinion on the subject of holidays and vacations is greatly at fault. Last December there was a universal whining and complaining because it so happened that the men in the Academic Department, with the exception of about one hundred, finished their examinations and left New Haven for the Christmas holidays five days before the unfortunates in Sheff were free to depart. Many of us actually believed that this arrangement was made purposely for the benefit of the Academic men, and few of us really investigated the matter to find out the real reason why this was so. Owing to the variety of courses offered for selection in Academic it is necessary to extend their examinations over a period of ten days duration. Most of the men there, with the exclusion of the slight exception mentioned above, so selected their courses at the beginning of the year that their examinations occurred during the first days of the period. When they had taken their examinations they were permitted to leave, although examinations continued to be held in that department until Thursday, Dec. 19th, the day officially appointed by the Governing Board for the closing of the Fall Term. Sheff has no elective courses; her examinations are conveniently held in a period lasting over six days. More or less time would have been unfeasable for many reasons. It was compulsory that the last examination be held on Dec. 19th, therefore it was necessary that we attend classes a week longer than the men in Academic. Could anything be more reasonable? It is right here where the undergraduate judgment in respect to truth degresses. We forget our advantages over Academic in being allowed the opportunity of being excused from examinations in which we have attained a meritorious grade. We forget that this extra week of classes is an advantage to us rather than a disadvantage. Why do we all so crave long vacations, special holidays and cuts in recitation. All of us came to college with the avowed intention of getting all we possibly could out of the innumerable advantages it offered, and, let us hope, not forgetting the while our purport to leave something to it in return created

by our own efforts. Why, then, if this is the case, do we all so zealously desire an opportunity to be idle? It is because we do not possess sufficient perspicacity to realize the whole value of every hour spent in a class room at Yale.

* *

## THE NEED OF IMPROVEMENT IN THE FRENCH AND GERMAN COURSES IN SHEFF

NOWADAYS with the exchange of domestic and foreign ideas and interests in general, there is a need that is felt very severely by the majority of business men. Perhaps the term "business men" might better be changed to include all those above the laboring class, *i. e.*, the people that have to think for themselves. That necessity is the ability to read, write, and speak foreign languages fluently.

Now let us hope and assume that all the students in Sheff will come under the category "above the laboring class" after graduation. Just how many of them will suffer from this almost national deficiency? For no matter what business the graduate enters, or what profession he undertakes, he is bound sooner or later, if not constantly, to meet some problem,—technical, financial, or otherwise,—that requires the thorough knowledge of some foreign language to solve. A conservative estimate of the percentage of students who will fall down sometime on a question of this kind would be ninety per cent, assuming there are a few foreigners.

How is this startling fact accounted for? It may here be noted that a student is required to have pursued only one modern language, ever, before entering Sheff, an omission of rather dubious advantage to the student. We then turn to the catalogue. There we see three hours a week recorded for two years in each of two foreign languages. Well, you might say, if a man can't learn a language after two hundred and forty hours work in it, besides having had it at prep. school, there's no chance for him anyway.

But does the student in Sheff ever get a chance to get the right kind of knowledge of French or German, the kind of knowledge he can put in practice when he graduates? (The Spanish department, though introduced here in Sheff the most recently of the three languages, has evidently seen light, so to speak, and offers a conversational course leading to highly practical results.)

The unsuspecting student comes in freshman year and is set to work immediately translating books that are of as little interest to him as they are to the instructor, the innocent perpetrator of the greatest of all sins—wasting opportunities. A high grade in the subject means, in most cases, both a small clear handwriting that can be read without confusion between the lines of the book translated, and a few hours tutoring or cramming before examination on the most important grammatic principles. This continues through Junior year. Junior year also marks the fatal day when he takes up the other language about which he is supposed to know nothing. However, if he is fortunate, by the end of the year, he will have mastered a few meaningless declensions and conjugations, and no doubt, the latest and most approved form of self assistance between the lines. Senior year is spent in putting these achievements into practice.

This may sound like an exaggeration of the highest degree, but without any shadow of a doubt that is exactly the state of affairs with the average student. Those above the average may not crib at all,—but at best their four hundred and eighty hours in the languages are wasted,—as they can be put to no practical use after the student leaves College.

What Sheff needs, and needs badly, are;

(a) The requirement of two modern languages for entrance, so the student already will have a good grammatic foundation for a basis of operation in College.

(b) Courses in the curriculum by which a man can learn not only how to read, write, and speak the languages fluently, but obtain practice, and lots of it, in doing so.

(c) Separate language courses for different general courses, so that a man on leaving could be sure that, if his profession called him to Germany, say, he would be reasonably certain of himself to carry out the undertaking.

For instance, in Senior Year, after having two years of conversation and practical reading and writing, the mechanical engineer should be given a course in the foreign languages that would include the most important subjects he is going to deal with when he graduates, as gas engines, steam boilers, etc. The Select Course in French, say might include subjects of a more romantic nature, as art, literature, and history.

Then when a man would leave Sheff he would be able both to cope with any situation that might arise and afford himself the opportunity of enjoying foreign ideas and foreign people in their natural state.

* *

## MINOR ATHLETIC ASSOCIATION DUES

OWING to the fact that the Freshmen teams do not draw a sufficiently large crowd to enable them to pay their own dues, members of the Freshman classes are asked to contribute something so that their teams may fittingly represent their class.

The situation in regard to the so-called minor teams of the University is similar. Each upperclassman is asked to contribute five dollars towards paying the expenses of these teams. This is the only athletic contribution that an undergraduate is asked to make after Freshman year, and surely it is very little to give five dollars for this purpose.

The Yale University Minor Athletic Union includes ten teams. These are the Hockey, Swimming, Basketball, Golf, Gun, Tennis, Soccer, Gymnasium, Wrestling, and Fencing Teams. Now, each of these teams is important. They all represent Yale and wear her emblems. Each affords exercise and recreation for a number of men. Yet all that we are asked to contribute is five dollars, or to put it in another way, fifty cents for each team.

When the collector comes around, pay up cheerfully. It is the duty of each member of the University to help in his own way to make Yale properly represented. This is a way that we all can help.

## A PLEA IN BEHALF OF HEALTH

IT really seems strange that in this advanced age of science, and especially in a Scientific School, one of the greatest safeguards for our health is merely mentioned in a few classrooms and is not practiced scientifically by anyone. We are speaking now of the heating and ventilation of our classrooms, or to be exact, the lack of *ventilation*. In our earlier days we were taught to care for our health, but not so now. We go into a recitation room, as the preceding class is leaving, generally followed by an instructor, just as the clock is striking. The air is thick, heavy, and sluggish, and commences to dull our minds. When the class is nearly half over the instructor realizes that no one has much life and calls for the windows to be opened. If the room happens to be a corner one, only those windows which produce the best draft are opened. This makes the air very pleasant in the winter time for those students who are not in the direct blast of it, and for the professor, who generally is seated in a protected corner. But what of those men sitting beside the open windows! Are they supposed to be mere empty seats, which cannot be affected by blasts of icy air, or are they supposed to be infants and not realize what is happening, or are they uncivilized descendants of the prehistoric ages?

Let us suppose instead that these men are students of the twentieth century, alive and awake. They object to the air. They cannot move to another seat as all are occupied. The clamor from the rear of the room demands that the windows remain open. What are these men to do, preserve their health and neglect learning by leaving the room?

One professor has even gone so far as to start what he terms an "open-air recess". The class begins in a stuffy room and the occupants commence to get sleepy. Then all of the windows are thrown open and for five minutes the breezes blow through the room; after this space of time the windows are closed, at least some of them are. Once again we have a case of the majority of the men being comfortable and a few are not. These few either appear the next time with a bad cold or possibly are at the Infirmary with a cold.

How much simpler it would be if the instructors would endeavor to provide for the facilities, which are so badly lacking in our buildings, by opening all of the windows in their class-room five minutes before recitation starts and filling it full of pure fresh air. Then by means of slight openings of the windows, the air could be retained in good condition during the entire hour. The results would be doubly good, for there would be less tendency to doze, there would be no interruptions caused by the opening and closing of windows, and also no one would be forced to sit in a draft.

* *

## SENIOR STATISTICAL BLANKS

THE Statistical Blanks have been distributed among the members of the Class of 1913S. It has been a custom, and a foolish custom we think, among preceding classes, to seize the occasion of the distribution of these blanks as an opportunity to display their wit. It cannot be denied that many members of the Senior Class are possessed of a vast amount of wit; nevertheless, these statistics, intended as a lasting record of the Class, are hardly a proper occasion for a display of facetiousness. Therefore, Seniors, we urge you to answer the questions on the statistical blanks seriously, and thus aid the Class Book Committee in the preparation of a real record. Surely it is not much of a sacrifice to deny oneself such an opportunity to crack a joke. Even so, it will save the Committee much unnecessary labor of verification and correction.

* *

## WINTER TRACK WORK

WINTER indoor track work has now been well started; it is a thing which is of much greater importance than is generally realized. The common attitude among undergraduates seems to be that Track work does not seriously commence until

the Spring, when all eyes naturally turn toward the track and the baseball field. Doubtlessly it is this erroneous attitude which prevents some men from giving the indoor practice the consideration and hearty support which it certainly deserves. No Spring work is of any more importance than the Winter work, and, in fact, the entire success of the Spring work depends upon how well and how conscientiously the other has been performed. In the quiet indoor work all the fundamental principles are learned; or in a word, that essential thing called "form" is acquired. Then when Spring comes, all these rudimentary points being disposed of, attention can be given to the fine points of the events. In the new baseball cage, Yale has an excellent place in which to carry on the indoor work. Let us not fail to realize the importance of this work, so that we may develop a strong Track Team this year.

* *

## THE WIDER USE OF BYERS HALL

DURING the past few years the Byers Hall Student Committee has striven, with commendable zeal, to make Byers Hall the real center of the social life of Sheff, and to secure its wider use by the undergraduates of the Scientific School. If the attendance at the Senior Smoker on December the sixth, as well as the wood-fire talk on the same evening, may be taken as a criterion, it would seem that these efforts are at last to be rewarded.

The great obstacle which the Byers Hall Committee has been compelled to face ever since the opening of the Hall, is that the average Sheff undergraduate seldom, if ever, visits Byers except for the purpose of consulting the books in the reference library. The two main causes for this condition are: first, the unfortunate lack of adequate dormitory facilities, which causes the student body to be widely scattered; and secondly, the lack of any attractions in Byers Hall itself. Although it is obviously impossible for the Committee to do anything towards alleviating the first of these, the second can of course be remedied. By the installation of a new piano, by providing wood-fires every after-

noon and evening, as well as by materially improving the lighting systems in both of the large rooms, the Committee has done much towards making the Hall more attractive. Arrangements have already been made for a series of bi-weekly wood-fire talks throughout the Winter Term, and it is planned to hold several class smokers similar to those held during the Fall. In this way it is hoped that more men may be influenced to use Byers Hall regularly.

Besides these improvements already completed, many others are being planned. A barber-shop for the exclusive use of Sheff men is to be opened shortly in the basement of the Hall. The old wooden lockers formerly used by those students living at some distance from school have been removed and new steel ones installed in their stead. It is understood that, if possible, a large library of the best English fiction is soon to be started, from which anyone may draw books, provided that they are not taken from the room. The execution of such plans will indeed add to the attractiveness of Byers, and, it is hoped, cause more fellows to spend their odd moments there.

In these and many other ways is the Byers Hall Committee striving to make the Hall more attractive to the undergraduates. Everyone, surely, will heartily support the Committee in carrying out its plans, for it is only by the unselfish coöperation of all that Byers Hall can be made to fill the place it should in the life of Sheff.

* *

## A COLLECTING OF BOOKS

FEW college men realize the advantages afforded by a collection of books. By the phrase "collection of books" we do not mean long shelves creaking under the weight of rows of "deep" books, uninteresting and unread, collected merely for appearances' sake, but a small, modest collection, suited to one's needs and ideals, that can comprehensively and profitably be assimilated. It is futile to attempt to state just what sort of books should be selected and what sort should be rejected. Every man must

discover his own books; he must determine what books coincide best with his personality, those which stimulate him to the highest thought, which fill that ever present gap in his nature, which raise him in conception and feeling. Too much emphasis cannot be laid upon the fact that the value of a library does not depend upon the size. A student's library may begin with a single volume, and increase even as slowly as a volume or two a year; but if those few are books which appeal peculiarly to him, they will be of more worth than rows upon rows of them that do not.

Do not be distressed if your preferences do not seem to favor the classics, or the time-honored works of lesser men. We all have different minds; the same books fail to please us all. Besides, the humorous side of one's nature should not be neglected, and where it lies undeveloped, it should be cultivated. Many brilliant and learned men have absolutely no sense of humor, a misfortune which seriously detracts from their personality. A good novel of the better sort is sometimes valuable especially when it supplies companionship of the pleasant kind. Start this year a collection of books that appeal to you. "Do so, it is a point of wisdom, and your wisdom should show itself more richer".

* *

## COMMUNICATION

THE SCIENTIFIC MONTHLY invites communications, but does not hold itself responsible for the sentiments expressed therein.

*To the Chairman of The Yale Scientific Monthly:*

Just as the ancient scribe of the one hundred years was quoted, "he who holdeth his seat of power for more than a week is going some", so has it come to pass in the good town of New Haven. The scientific and technique forces are being tortured and humiliated by their bloodthirsty rivals—the lights of the literary and romantic world. In other words, the future poets, thespians, etc., must have their day—and according to all reports they are having it. In fact, most of them are having from four to seven days.

What can be done? Is science to be throttled to the tune of a fair lyric? Help! help! let the Mechanical Engineers' Club, the Chemists' Club, the Convicts' Club, be assembled to arms—to arms! Let us march to the palace of justice and demand our rights, in general, and our vacation, in particular.

But hold—where are our guardian angels—our would-be godfathers,—the faculty? In them we have always placed our utmost confidence and trust to shield us from foreign invasions and murderous attack. What—they have deserted us? We are betrayed? Woe be the Sheffield Scientific School. Unlucky pursuers of wisdom! Lucky are we to escape with from four to seven days extra imprisonment in Fort New Haven.

Joy to the victor sitting by his domicilic fireside, complacently contemplating his eighteen hour sleep on the morrow and his three weeks vacation. Misery and despair to the future engineer crouching by his dreary desk, tremblingly awaiting the advent of the cold dawn and his first exams!

1913S.

JOSEPH EARL SHEFFIELD.

# JOSEPH EARL SHEFFIELD

*A. M. Chickering.*

NOW that the importance of the Sheffield Scientific School has become so great in the field of scientific and practical education, it behooves the students of the School to strive to keep alive the remembrance and appreciation of those men who were intimately connected with its early life. Among these there is none to whom we owe so much as we do to that man who has been justly called "the father of the Sheffield Scientific School", Joseph Earl Sheffield. It is with the hope of being able in a small way to bring before the readers of the YALE SCIENTIFIC MONTHLY a slight knowledge of the greatness of Mr. Sheffield that this short biography has been prepared.

Mr. Sheffield was born in Southport, Connecticut, on June 19, 1793, of old New England stock. His grandfathers, both paternal and maternal, had been ship-owners and ship-builders. His father was active in privateering during the American Revolution, having, with his brothers, equipped and sailed a ship which subsequently saw hard service in several battles. After the close of the War, together with his father-in-law, Captain Thorpe, Captain Sheffield went into the West Indian trade. At this they were very successful and were prospering when, in 1806-07, the operations of Napoleon's Decrees swept away their entire fortunes along with those of many other New England traders.

That the sea called to young Sheffield as it had to his ancestors is demonstrated by the fact that he left the village school at the age of fourteen and made two trips to the Carolinas as cabin-boy.

He was, however, destined for a business career, and soon after, in 1807, Joseph Sheffield became a clerk in the employ of Mr. Stephen Fowler of Newbern, North Carolina. He left this position after about a year, and secured a place in the drug store of Dr. Webb in the same town, where he remained until the spring of the year 1812, when he went back to Connecticut to visit his parents. During this visit war was declared against Great Britain.

The following year he distinguished himself by acting as supercargo of a vessel which ran the British blockade at Sandy Hook and brought back a load of naval stores. In recognition of his services, before he was even of legal age, he was made a partner in the firm which had sent out the blockade-runner. The judgement of his co-partners was soon vindicated for, in the troublesome times which followed the war, his sagacity and foresight steered his firm prosperously through while many firms collapsed.

The year 1816 found Mr. Sheffield again on the move. Business was at a standstill in North Carolina and he decided to try his fortune elsewhere. Alabama, which was newly settled and rapidly growing, caught his fancy and, after a horse-back ride of exploration through more than a thousand miles of Indian territory, he decided to settle in the then small town of Mobile. Though that town had at that time a population of only one thousand, Mr. Sheffield had his whole stock of goods shipped there. Upon their arrival in 1817, in accordance with his policy, he sold out his stock at low prices and invested the proceeds in cotton and raw furs. In Mobile, Mr. Sheffield was again very successful, succeeding in building up an extensive and profitable trade. In 1822 he married Miss Maria St. John, of Walton, New York, and about thirteen years later, in 1835, he decided to move North with his growing family. The reasons for this decision cannot be better explained than by quoting his own words on the subject. In 1834 he wrote to a friend: "I have made up my mind positively to leave Mobile next spring and settle somewhere north of the Potomas * * * My great object is to live in a community where I can give such education to my children as will fit them for a rational and religious course in this life, and prepare them for a better. These considerations have far greater weight with me than all the money I might accumulate here at the expense of them, and in selecting a residence for life, I shall have this object constantly in view without regard to personal considerations or business". Again, in 1876, in a review of his political life he writes thus: "In the spring of 1835, I removed from Mobile and took up my residence in New Haven. The ill health of Mrs. Sheffield in that sickly climate and the rapid increase of my family —which we were unwilling to have educated in a *slave* Commu-

nity—and above all an abhorrence of slavery made this course necessary". Accordingly as may be gathered from the extracts Mr. Sheffield, in 1835, moved to New Haven. While at Mobile he had built an extensive fortune and had been one of the leading citizens of that city. At one time, having served as confidential director of the Mobile branch of the United States Bank with the greatest satisfaction to the officials and credit to himself, he was offered the Presidency by Mr. Nicholas Biddle, President of the main United States Bank. His business cares, however, compelled him to decline.

However, the removal of Mr. Sheffield to New Haven by no means interfered with his business ventures, for it was during his residence in this city that he carried out the most important and successful enterprises of his career. For several years after his removal he continued his former business of buying and shipping cotton and was accordingly obliged to spend winters in Mobile. In this connection he became acquainted with some of the most prominent American financiers and capitalists of the time.

Sometime before 1840 a majority of the stock of the old Farmington Canal came into the hands of Mr. Sheffield. On account of this he became well acquainted with Mr. Henry Farnam, who in the capactity of engineer had been connected with the Canal since its beginning. This acquaintance soon ripened into a close friendship which resulted in their carrying out together during the next thirty years some very important business measures.

To all probabilities there are very few Yale men at present who realize the prominent part played by Mr. Sheffield in the joining of New York and New Haven by rail. Nevertheless it is a fact that it was largely through his efforts that this took place. In the summer of 1843, he suggested this to Judge Samuel J. Hitchcock, a fellow-director of the road from Hartford to New Haven. The latter was much in favor of the plan and in the spring of the following year the charter for its construction was granted. At Mr. Sheffield's expense, a survey of the proposed route was immediately made, while in 1845 he went to England to interest the great house of Baring Brothers in the measure, accomplishing his purpose only after much delay. In the mean-

time, however, his partner, Mr. Farnam, had not been idle, but had negotiated for the right of way with most of the claimants on the line of survey. From this time on the success of the new road was assured and everything went ahead in fine shape until its completion.

It must not be supposed, however, that every one of our benefactor's business enterprises were successful in a financial way. The one great exception was in connection with the old Farmington Canal which has been mentioned before. Exhilarated by the success of his first railroad venture, Mr. Sheffield, having succeeded in interesting Mr. Farnam, decided to build a railroad along the banks of the canal as far as Springfield. All went well for a time and the road actually was built as far as Plainfield, but at this juncture unforeseen complications and serious troubles arose which put a stop to its further construction. As a result of this failure, Mr. Sheffield was obliged to assume responsibilities which weighed heavily on him for the rest of his life.

About this time, people began to appreciate the wonderful possibilities of the West, with its new field of building and trade. To this part of the country the two men, Sheffield and Farnam, now turned their attention and, indeed, it is there that they were destined to perform their greatest labors. Their first undertaking was to finish the last hundred miles of one of the great Western railroads to Chicago. It has been stated by authorities that real estate values jumped to twice their former value when a railroad first connected that growing city on Lake Michigan to its older sisters on the ocean. The next project of these enterprising men was a movement still further toward the Pacific coast—the construction of the Chicago and Rock Island Railroad. After its completion over a thousand people were invited to an excursion and tour of inspection which covered most of the new road. The bridging of the Mississippi River was the movement which next engaged their attention. This was completed after some delay, caused by legal interference. With the completion of this business, Mr. Sheffield practically retired from active participation in his work and returned to New Haven, where he consumed his time in the administration of his large estate and in devotion to his home interests.

The most striking thing about Mr. Sheffield in his business dealings was his complete devotion to high principles. He was "honorable from the convictions of his own conscience and the sentiments of his heart." It is to his lasting credit and honor that his wealth came to him untainted with the stain of sharp practices or trickery of any sort.

Mr. Sheffield's interest in Yale probably began soon after his arrival in New Haven, for several members of the Faculty became his friends and sympathizers at that time, when friends and sympathy counted for much. The struggling Department of Philosophy and the Arts attracted his attention and in 1855 he made his first gift to the School. Moreover, in 1854 his daughter had married Professor John A. Porter, Professor of Analytical and Agricultural Chemistry, a fine, broadminded scholar of varied attainments, who seems peculiarly fitted to have interested a man like Mr. Sheffield. The interest in the School, once aroused, never abated but rather increased as the years went by and our benefactor saw the seeds of his generosity bearing much rich fruit.

In 1858 the old Medical College, having been purchased for $16,500, was enlarged and refitted at an additional expense of $35,000. The building, now Sheffield Hall, was completed in time for the opening of the college year in the fall of 1860. In the latter part of the same year an additional endowment of $40,000 was added by Mr. Sheffield, and about five years later, after the State grant of $135,000, he again enlarged Sheffield Hall at an expense of over $46,000 and gave a library fund of $10,000. It was due to his influence that the first professorship of the School was founded by Mrs. Higgins about this same time.

For the next five years the School grew very rapidly and Mr. Sheffield's generosity more than kept pace with this growth by the gift, in 1870-71, of the land upon which North Sheffield Hall now stands. At the same time he contracted for the erection of the building, at a cost of $115,000. Many other large gifts to the current expenses and additions to the income of the School were made by Mr. Sheffield, until at the time of his death on February 16, 1882, the total of his gifts was more than $450,000. By his will his beautiful and valuable residence on Hillhouse Avenue, its grounds, and a generous slice of his large estate fell to the School,

making a total of more than a million dollars in gifts to the School.

The gift of a million dollars or more to found a school to be called after the name of its donor is not uncommon in these days. Sixty years ago, however, it was an almost unheard of occurrence and demands our attention and praise the more because of the absolute lack of the self-interests of the giver towards the School which he loved. He never tried to monopolize the giving of funds to the School so as to perpetuate his own name. He always sought to interest others in the work and it was only to assure the wished-for growth of the School that he was so far in the lead of all others interested. Mr. Sheffield never intimated that it was his wish that his name be given to the school which he fostered. On the contrary he was long urged privately by friends and twice asked publicly by the Corporation before he consented to have his named used, and then only upon the plea to him that it would be for the lasting benefit of the School.

It must not be supposed, however, that the Sheffield Scientific School was the only institution to benefit by his wise and generous beneficence. Trinity College, of which he was for many years a trustee, received donations amounting to more than $16,000. The Berkeley Divinity School, of Middletown, was made the recipient of a gift of $175,000. Among the list of his other benefactions appear those to the Parish School of Trinity College and the Parish Home for Old Ladies.

Although his only education consisted of a few years in a public school during his early youth, the want of this was early filled by the polish and education attained in the great school of life. His letters and business papers prove him to have been a man of superior intellectual powers. He always keenly appreciated the beautiful in Art and Literature.

In politics as in other great questions, he, like all other great men, possessed decided opinions and ardent sympathies. During his life in the South, he was known as a man of Northern principles. He never had any patience with the Nullification and States' Rights doctrines and always hated the institution of slavery. On the other hand he did not sympathize with the Anti-Slavery movement which he found after moving North. After he had cast

his vote for Bell and Everett in 1860, he withdrew from all political activity and never even voted thereafter. All through the great war he was beset with the gloomiest forebodings as to the future of the country and could see nothing ahead under the administration of the Lincoln Republicans, but final collapse. This feeling, however, did not prevent him from making many large contributions for the relief of the sick and wounded soldiers in the hospitals. After the close of the war and the re-establishment of law and order in the country, he agreed with all others that the abolishment of slavery had been a Godsend to the whole nation.

Among Mr. Sheffield's characteristics as a man by no means the least was his devotion to the highest ideals of Christian brotherhood and kindness, and to the Church. During his life in New Haven and Mobile he and his family were always good church members.

Let us not forget in our hours of ease and pleasure the one to whom we owe so much. Had it not been for his benevolence, today the Scientific Department of Yale University would not be on such a high footing.

## CUSTOMS AT YALE A CENTURY AND A HALF AGO

*B. Bowman.*

EVERY alumnus likes to look back and laugh good-naturedly at some of the traditions and extinct laws of his alma mater. On this score many an hour is spent in keen enjoyment where two or three sons of Eli get together and begin exchanging reminiscences.

Going back years beyond the memory of any gray haired alumnus we find rules and college customs which read very strangely nowadays. Some extracts from the manuscript laws of the college which were thought out and written down with a most serious intent will, I am afraid, excite the sense of humor of many a modern collegian.

For example, we find the following rule, which existed from the founding of the college down to 1768:

"Every student shall be called by his sir-name except he be the son of a nobleman, or a knight's eldest son." The class roll was accordingly made out with the student of highest social rank at the head of the list, each name following according to the social position of its bearer.

In those days the president was a being of majestic dignity: no undergraduate was permitted to wear his hat within ten rods of that august person. The professor was likewise protected by law and could not be approached uncovered within eight rods, and even a tutor then received obeisance within twenty-seven and a half yards.

The Freshman, poor fellow! whenever he spoke to a superior, which included all above him, even the Sophomores, or was spoken to by one, was obliged to keep his hat off until bidden to put it on.

Likewise amusing, are the college laws, printed in 1764, and in force long after:

"A Freshman shall not play with any members of the upper class, without being asked; nor is he permitted to use any acts of familiarity with them, even in study time."

"In case of a personal insult a Junior may call up a Freshman and reprehend him. A Sophomore in like case must obtain leave

from a Senior, and then he may discipline a Freshman, not detaining him more than five minutes."

"Freshmen are obliged to perform all reasonable errands for any superior, always returning an account of the same to the person who sent them. When called they shall attend and give respectful answer; and when attending on their superior, they are not to depart until regularly dismissed."

"When a Freshman is near a gate or a door belonging to college or college yard, he shall look around and observe whether any of his superiors are coming to the same; and if any are coming within three rods, he shall not enter without a signal to proceed."

Of course it does not follow that "five minutes" was always sufficient time for the Sophomore to "discipline" the pluckiest of the Freshmen; nor that the "superiors" always had their "errands" carried out to their entire satisfaction. That the "superiors" were occasionally outwitted is plainly shown by the following story.

A Senior once gave a Freshman a dollar and directed him to go to the most distant store from the college and purchase pipes and tobacco. The Freshman departed with becoming humility, and soon returned with ninety-nine cents' worth of pipes and a cent's worth of tobacco. Whether he was forthwith "disciplined" or not the tradition does not state.

Referring to this servitude of the Freshman, President Woolsey remarks, in his "Historical Discourse," delivered to the graduates in 1850: "All this was very gravely meant, and continued long in use. The Seniors considered it as part of the system to initiate the ignorant striplings into the college usages, and they performed their duties with the decorum of dancing masters."

Until 1800, it was required of the "ignorant striplings" that they should run errands for resident graduates and for the two upper classes, anywhere within the limits of a mile; their formal exemption from such service came about in 1804.

Commencements, a hundred and fifty years ago, were different in some respects, from the mild affairs of today. At that time they were occasions of such hilarity that the corporation was obliged to exert itself, by stringent laws to control the exuberance of the departing Seniors. Cannons were fired, and it was usual

for the graduating class to provide a "pipe of wine", free to all comers. This, in 1760, took the place of the "barrel of metheglin", which, by a law of 1746, "the Seniors may provide and give away, and nothing more"; and when the authorities, compelled by the disturbances and confusions which followed from the "pipe of wine", undertook to break up the custom of the general "treat", the Seniors rebelled, brought large quantities of rum into college and carried on to such an extent that the Commencement exercises were suspended. Such a state of affairs did not occur again, although for a long time that anniversary wore as much the aspect of a presidential election of a few years ago as of a solemn literary festival.

Let us all, especially the Freshmen, be thankful that, with respect to these institutions, Yale has become safe and sane.

NOAH PORTER MEMORIAL GATEWAY.

(IN PROCESS OF CONSTRUCTION.)

# THE BUILDINGS OF YALE UNIVERSITY

*F. D. Van Sicklen.*

SINCE 1717 Yale University has had seventy-one buildings, fifty-eight of which have been gifts from alumni and different individuals, the remainder being erected or purchased from University funds. Thirteen of these have been demolished to make room for newer and more permanent structures, two of which are now in the process of erection and the plans for the Day Mission Library have not yet been completed.

In 1717 Yale College obtained a grant of $500 from the Colony Assembly for a permanent building to be erected near the present sight of Osborn Hall. It was used as a chapel, dining hall, library and dormitory, and was finally demolished in 1782. In 1722 funds were secured by a gift of Governor Elihu Yale, with additions consisting of another grant from the Colony Assembly and private subscriptions for a President's House, which was located near the present site of College Street Hall. It was sold in 1801 and finally torn down in 1834. For both these Henry Cancer of New Haven was the architect.

No other building was erected until 1750, twenty-eight years later, when Connecticut Hall was built by funds provided mostly by the Colony Legislature. Its name was later changed to South Middle College, but in 1905, the original name was restored, and also the restoration of the building took place at the same time.

In 1793 Union Hall, and in 1797 the second President's House were erected, by Legislative grants, with additions from College funds for the latter. It stood on the present site of Farnam Hall and in 1847 was used as a chemical laboratory, later becoming the first home of the Scientific School. Union Hall was demolished just a hundred years after its erection, and the President's House in 1860. Again in 1803 Legislative grants were secured to erect the Lyceum and Berkeley, which later was known as North Middle College. The former was demolished in 1901 and the later in 1896. For the second President's House and the Lyceum Peter Bonner of New Haven was the architect.

In 1835 Divinity College was established on the site of Durfee Hall, and in 1842 Old Library was erected out of brownstone. Money was obtained for both by gifts of sundry donors, with additions from Yale College for the latter. Divinity College was removed in 1870 to make way for Durfee Hall. In 1853 the Linonian and Brothers Societies presented Alumni Hall to the College. It was also constructed of brownstone, and contained recitation and examination rooms of the Academical Department. It was finally demolished in 1911 to make way for a new dormitory.

In 1859 Joseph E. Sheffield of New Haven presented Sheffield Hall. It was formerly used by the Medical School, being purchased in 1814 with a Legislative grant, but was fitted out later with modern laboratories and recitation rooms. Again in 1869 two brick buildings, Farnam Hall and East Divinity Hall, Edwards Hall after July 1, 1909, were erected. The former is an Academical Department Dormitory and the latter contains recitation as well as student rooms. Farnam Hall was a gift of Henry Farnam of New Haven, and Edwards Hall was a gift of sundry donors. In 1870 Bradford M. C. Durfee of Fall River, Massachusetts, gave money for another Academical Department Dormitory, which was erected with additions from Yale College.

In 1871, a small brick chapel was erected by means of a gift of Frederick Marquand of New York, which was named after the donor, and is now used by the Theological School. In 1874 sundry donors erected West Divinity Hall (brick) also for the use of the Theological School. It contains recitation and students' rooms, and in 1909 was renamed Taylor Hall. Also in 1784 Joseph E. Sheffield of New Haven presented to the Sheffield Trustees North Sheffield Hall, a large brick building containing only recitation rooms.

George Peabody of London, in 1876, presented the University with a large brick museum, and also in the same year Joseph Battell, and the Battell family of New York City, with additions from Yale College, erected for the Academical Department a beautiful brownstone chapel. Three years following, in 1879, Oliver F. Winchester gave money to the University for a brick

observatory, and in 1881 Frederick Marquand of New York again presented funds to the college which were expended in building the Trowbridge Library, for the Theological School, a large brick structure.

In 1882 and 1884 two more brick buildings were added to the large number already given. The Sloane Laboratory was a gift of Henry T. Sloane and Thomas C. Sloane of New York, and is used by the Academical Department for a Physics Laboratory. The Academical Department Dormitory, Lawrence Hall, was pre-

NORTH MIDDLE COLLEGE.

sented in 1884 with the funds given by Mr. and Mrs. Francis C. Lawrence of New York City, with additions from the college. In 1886 the two brownstone structures, Dwight Hall, Y. M. C. A., and Kent Laboratory, were presented to the Academical Department; the former by Elbert B. Monroe of Southport, Conn., and the latter by A. E. and William Kent of Chicago.

Simeon B. Chittenden of New York City, gave to the University in 1888 the red stone Chittenden Library, and in the same year Mrs. Miriam A. Osborn of New York City presented the Academical Department with a granite building containing recitation rooms. In 1889 by means of a legacy of Joseph E. Sheffield of

New Haven to the Sheffield Trustees, the brick Biological Laboratory was erected for the use of the Scientific School.

Welch Hall Dormitory was presented to the Academical Department in 1891 by Pierce N. Welch of New Haven, and also in the same year Winchester Hall, containing laboratories and recitation rooms, was erected with the funds given by Mrs. Oliver F. Winchester of New Haven, with additions from others. The former structure is built of brownstone and the latter of brick. In 1892 two very much needed structures were erected by means of gifts of sundry donors; namely, the University Gymnasium and the University Infirmary, both being built of brick. Again in 1893 the Academical Department received two new dormitories, one of brownstone and one of brick. The former, Vanderbilt Hall, was a gift of Cornelius Vanderbilt of New York City, and the latter, White Hall, was presented by Dr. A. J. White, also of New York City. Hendrie Hall, a brick building with a limestone facade, containing recitation rooms and library, was given to the Law School in 1894 by John W. Hendrie, with additions from others, and also in the same year, by means of gifts of sundry donors to the Sheffield Trustees, Sheffield Chemical Hall, a brick structure, was erected for the use of the Scientific School. A brownstone structure, Phelps Hall, containing recitation rooms, was given in 1895 to the Academical Department by John J. Phelps of New York City, and William Walter Phelps of Englewood, N. J., with additional funds from the Phelps family.

From 1900 to 1903, ten magnificent buildings were presented to the University. In 1900 by means of the legacy of Nathaniel C. Marsh of New Haven, a brownstone structure, Marsh Hall, containing recitation rooms and laboratory, was erected for the use of the Forestry School. Miss Caroline P. Stokes and Miss Olivia E. P. Stokes of New York City gave in 1901 to the University Woodbridge Hall, a limestone building, containing the administration offices; and also in this same year Mrs. Thomas G. Bennett of New Haven presented the brick Clinical Building to the Medical School. During the course of 1901 and 1902 three University buildings, the Dining Hall, Woolsey Hall and Memorial Hall, were erected by means of gifts from the Alumni and friends, with additions from the University. The Dining

Hall is for the use of students in all departments, and Woolsey Hall is an auditorium for lectures and concerts. In 1902 a beautiful limestone structure, Byers Hall, was presented to the Scientific School Y. M. C. A. by Mrs. Martha F. Byers, of Pittsburg, Pa., and in the same year, Mrs. Lucy H. Boardman of New Haven presented to the Sheffield Trustees funds for the erection of a brownstone Mineralogical Laboratory, to be used by the

OLD TREASURY BUILDING.

Scientific School. Also by means of the legacy of William Lampson of LeRoy, N. Y., Lampson Hall, a brick building, containing recitation rooms, was erected for Academical Department, and at the same time Frederick W. Vanderbilt of New York City presented to the Sheffield Trustees funds for the erection of a limestone dormitory for the students of the Scientific School.

In 1905, by means of the legacy of William B. Ross of New York City, Linsley Hall, the University Library, was constructed of brownstone. John Hays Hammond of New York City presented funds in 1906 to the Sheffield Trustees for the

erection of Hammond Laboratory, a brick structure containing Mining and Metallurgical Laboratories for the use of the Scientific School; and in the same year Frederick W. Vanderbilt again gave the Scientific School another dormitory of limestone. In 1908 the Sheffield Trustees, by means of a gift of Mrs. James Brown Oliver of Pittsburg, Pa., erected a magnificent limestone structure, Leet Oliver Memorial Hall, for the use of the Scientific School, containing recitation rooms and professors' offices. During 1909 the Academical Department received a legacy from William L. McLane of New York City for the construction of the brick dormitory, Haughton Hall, and also Andrew Carnegie gave the University a swimming pool, which adjoins the gymnasium. In 1910 Messrs. Henry T. Sloane and William Sloane of New York City presented the University with a physics laboratory of Long Meadow brownstone, called the New Sloane Laboratory, and Messrs. George Grant Mason and William Mason of New York City gave funds to the Sheffield Trustees for the erection of Mason Laboratory, a brick building containing a laboratory of Mechanical Engineering. The plans for the Day Mission Library, a gift of George E. Day and Olivia H. Day of New Haven to the Theological Department have not yet been completed. A donation by Mr. Austin C. Dunham of Hartford, Connecticut, has made possible the erection of an Electrical Laboratory, which is now under construction. Mr. Henry G. Morse, aided by Professor Charles F. Scott, designed the building. All the aforementioned buildings have been gifts to the University by different individuals.

The following buildings have been constructed or purchased from funds of the College. In 1761 the Old Chapel and Library was erected, and used until 1893, when it was demolished. In 1782 the Dining Hall or Commons was constructed, and from 1820 to 1882, when it was torn down, it was known as the Chemical Laboratory. During 1818 the second Dining Hall was built, and was used as such until 1842, when it became known as the Cabinet until it was removed in 1890. In 1820 and 1823 North College and Old Chapel, the second one, were respectively erected. The former was demolished in 1901, and the latter in 1896. During 1859 a brick gymnasium was built, and in 1892 was converted

into the Dining Hall, and in 1902 into Herrick Hall, which is now the Academical Department Psychological Laboratory. In 1860, 1892, and 1893 the three brick buildings, Medical College, Medical Laboratory, and Berkeley Hall, were respectively erected, the latter being an Academical Department dormitory. In 1895 the University purchased College Street Hall for the use of the Music School, a brick structure containing recitation and practice rooms. In 1896 the Academical Department erected a brick dormitory, which they called Pierson Hall. Again in 1899 the College bought

ALUMNI HALL.

another brick building for the Music School, containing the executive offices of the School, and rooms for a few students. During 1902 the Academical Department constructed another brick dormitory, Fayerweather Hall.

At present one of the most urgent needs of the college is a new building containing recitation rooms, professors' offices, and a large examination room. Since the destruction of Alumni Hall, to make way for the Wright Memorial Dormitory, the need has been more greatly felt than ever. In all probability a new building containing the desired features will be erected in a short time on Library Street.

# GRADUATE WORK IN SHEFF

*J. Hunt.*

VERY little is known of the work of the Graduate School throughout the undergraduate body. Nevertheless, it is one of the most important of the departments of the University. Essentially a graduate school, it admits not only Yale men, but also men from a great variety of both foreign and American colleges. In this school a very wide choice as to courses is offered. One may study purely Academic subjects, Scientific subjects, Theological subjects, or a selected course of various subjects in different departments. During the last seven years, as the table shows, there have been no less than thirty-one separate courses elected which are composed distinctly of Scientific School subjects. In the preparation of this list, care has been taken to include only those courses of study which are distinctly those studied in Sheff, and it is hoped that the table will give some idea of the wide extent of the curriculum of the Graduate School as regards Sheff.

It will be noticed that for the last seven years Chemistry, Mathematics, Physics, and Physiological Chemistry have been the favorite studies. It is interesting to note that in the year 1911-12 there are included no men taking any engineering course.

The following table gives a record of the number of men, according to the University records, who took a graduate course in Sheff during the years 1905 to 1912 inclusive. It shows which course the students took, in addition to recording the number of students in each course. The members of the Graduate School all have degrees from some college, with the exception of a few teachers who have been admitted without a degree.

COLLEGE YEAR.

| *Course.* | 05-06 | 06-07 | 07-08 | 08-09 | 09-10 | 10-11 | 11-12 |
|---|---|---|---|---|---|---|---|
| Anthropology | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| Bacteriology | 4 | 2 | 3 | 2 | 2 | 2 | 2 |
| Biological Chemistry | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Biology | 4 | 4 | 3 | 3 | 5 | 6 | 7 |
| Botany | 4 | 5 | 6 | 5 | 5 | 3 | 5 |
| Chemistry | 22 | 21 | 29 | 26 | 25 | 24 | 28 |
| Civil Engineering | 7 | 3 | 0 | 0 | 0 | 7 | 0 |
| Electrical Engineering | 1 | 0 | 1 | 10 | 5 | 1 | 0 |
| Electricity | 2 | 2 | 1 | 0 | 0 | 0 | 0 |
| Engineering | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Geography | 0 | 0 | 0 | 0 | 1 | 3 | 0 |
| Geology | 6 | 6 | 9 | 6 | 10 | 12 | 18 |
| Hygiene | 0 | 0 | 1 | 0 | 0 | 1 | 2 |
| Mathematics | 19 | 14 | 20 | 18 | 18 | 17 | 8 |
| Mechanical Engineering | 4 | 7 | 8 | 8 | 4 | 7 | 0 |
| Metallography | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Metallurgy | 4 | 0 | 0 | 0 | 0 | 1 | 0 |
| Meteorology | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| Minerology | 2 | 2 | 3 | 1 | 0 | 0 | 0 |
| Mining | 3 | 6 | 5 | 0 | 0 | 2 | 0 |
| Mining Engineering | 1 | 1 | 0 | 8 | 10 | 10 | 0 |
| Natural Science | 2 | 1 | 1 | 1 | 0 | 0 | 0 |
| Organic Chemistry | 0 | 0 | 0 | 3 | 3 | 1 | 3 |
| Paleontology | 2 | 1 | 2 | 3 | 1 | 2 | 1 |
| Petrography | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Physics | 10 | 10 | 11 | 10 | 10 | 10 | 7 |
| Physiography | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Physiological Chemistry | 5 | 11 | 13 | 13 | 12 | 11 | 8 |
| Physiology | 1 | 2 | 1 | 3 | 3 | 1 | 0 |
| Sanitary Engineering | 2 | 0 | 0 | 2 | 2 | 7 | 0 |
| Zoology | 4 | 0 | 0 | 0 | 0 | 1 | 1 |

# MUNICIPAL GOVERNMENT BY COMMISSION

*P. R. Anness.*

THE most conspicuous single development in the field of municipal politics of recent years has been the introduction and rapid spread of the commission form of government. Originating in Galveston, Texas, shortly after the disastrous flood of 1900, it proved so successful that it spread with rapid stride from one end of the nation to the other, until at the present time there are in the United States one hundred and fifty-six cities whose municipal affairs are under the commission form of government.

The keynote of this system is simplicity. It is an attempt to place the city affairs upon commercial and financial methods. A board, or "commission", consisting of the mayor and three or four commissioners, elected by the city as a whole, has entire control of the municipal affairs. It has power to levy taxes, vote appropriations, enact and enforce laws, and superintend the whole administration. In short this board, elected by the people and responsible directly to the people, forms the entire government of the city. How simple this is when compared to the old form of city government. A small, directly responsible administrative body, which resembles the board of directors of a business corporation, takes the place of the mayor, council, and numerous boards, among which in the past the powers and duties of the administration were divided. The very nature of this scheme, with its abolishment of the old methods of checks and balances, and all their various routine and "red tape" practices, insures a more direct and efficient government. The small number of officers constituting the governing body greatly facilititates and expedites the transaction of business and the making of public improvements. In addition to the small number of men on the board, each commissioner is placed at the head of one department of the government, of which he is in control and for which he is responsible. The administration is generally divided into five departments—public affairs, accounts and finance, public safety, streets and public improvements, and parks and public property. The assignment of each commissioner to take charge of one of these several departments, for the conduct of which he is directly

responsible to the commission and to the people, naturally brings about a more efficient management of these departments than could be possible under the old form of government. The division of duties and direct responsibility is shown by the following chart:

VOTERS

with
Initiative
Referendum
Recall

COMMISSION.

Mayor
Commissioner
Commissioner
Commissioner
Commissioner

DEPARTMENT OF PUBLIC AFFAIRS.

Civil Service Commission
Board of Education
City Clerk

DEPARTMENT OF FINANCE.

Treasurer
Auditor
Board of Assessors

DEPARTMENT OF PUBLIC SAFETY.

Police
Fire
Health
Relief

DEPARTMENT OF PUBLIC WORKS.

Engineering
Water
Streets
Sewers
Lighting

DEPARTMENT OF PUBLIC PROPERTY.

Parks
Buildings
Markets
Harbors

CHART OF GOVERNMENT OF CITY BY COMMISSION.

As the above chart shows, although the actual powers under this form of government are no greater than under the old system, they are more centralized and in the hands of fewer men. This centralization of both power and responsibility insures an effective government.

From such a purely business administration it naturally follows that greater economy will result. That this is true is proved by the statistics of the cities that are at the present time under the commission form of government. Galveston was in a very bad shape financially when she first adopted this new system. In a remarkably short time all the damage done by the flood had been repaired, new docks erected, water works constructed, a large part of her debt paid off, and all this done without issuing new bonds. Her finances are at the present time in a condition of prosperity unparalleled in her history. The results in every other city in which the commission is in effect have been the same. The finances of every one of them have shown an improvement, not only unexpected but almost unprecedented in the history of municipal government. Finances and the cost of government is perhaps in the popular mind the most vital question in deciding upon the desirability of a certain form of government. And it is in this respect, above all others, that the most notable improvements of the new system over the old has been shown, for it is in money matters that the business methods upon which the scheme is based show their efficiency. The chief factor in bringing about this remarkable economy in municipal government, a thing hitherto unknown, is the elimination of the city boss, prevention of favoritism, and raising of the standard of officials under the commission.

The elimination of boss rule is perhaps the most noteworthy advancement in the fight for clean politics that has ever been made in this country. The evils and corruptions under bosses are too well known to require any explanation. The boss is the result of the diffusion of municipal authority among mayor, councilmen, and various boards under the old form of city government. This division of power enables an expert in practical politics to gather up the loose ends of power and wield them to his own advantage. "Pulling the strings of authority" is an old expression

which very aptly expresses the bosses' position. The necessity for the political machine arose because the number of elective officers under the municipal government was so great that some such system was required to attend to their nomination and election. The boss directs the machine and in doing so constitutes the real ruler of the city. Under the commission form, on the other hand, the concentration of all power into the hands of one single board, and the definite relation of each member of that board to the several departments of the administration destroys the power of the boss. There are no longer any loose ends of power for him to wield; every commissioner has definite powers, definite duties, and definite responsibilities which not only eliminate the necessity for the boss, but make his very existence impossible.

Another very important reform inherent in commission government is the abolishment of the ward system of elections. That the governing body consider the city as a unit, and hold its general welfare paramount to local selfishness is a necessity to good government. This is impossible under the ward system. The election of the commissioners from the whole city and not from one ward makes these officials responsible to the city as a unit. This is no more than right, for physically, socially, and economically the city is a unit. Its arbitrary division into wards, for the purpose of electing councilmen, has always tended to promote local selfishness which is distinctive to the general welfare. Under ward government no definite results are required, no order of procedure is established, and no method of accountability enforced. The commission form leaves no break in the chain of responsibility. Every employee and subordinate in each of the several departments of the administrative is responsible to the commissioner in charge of that department, who in turn is answerable to the entire commission for his department, and both the single commissioner and the board as a whole are responsible to the people for the proper administration of the government. The responsibility is so centralized that it cannot be evaded. This chain of accountability is backed by two checks that insure efficient service. These checks are publicity and the powers of initiative, referendum, and recall in the hands of the voters. The commis-

sion is required to publish monthly or quarterly accounts of their finances and legislative proceedings in a pamphlet form and distribute them among the voters. The possession of powers of recall by the voters insures the direct responsibility of the officers to the people. In short, therefore, we have, under the commission, a thorough, direct, responsible government, with full powers definitely located and thoroughly organized to insure good service.

FORREST LEONARD DANIELS MEMORIAL GATEWAY.

# MOVING PICTURES

*A. F. Blake.*

WITHIN the last few years an entirely new form of dramatic entertainment has suddenly come to the front. In an almost incredibly short time the moving picture industry has become one of the most important in our country. Half a million people are directly or indirectly engaged in the business of producing the pictures, and the money invested amounts to $200,000,000. The American people are spending $500,000 a

THE FIGHT ON THE PLAINS OF "ARABIA" IN PROGRESS.

*Courtesy The World's Work.*

day at the 20,000 moving picture shows in the country. Is it any wonder that the supporters of the old time theaters gasp when they see these figures, and wonder how long it will be before the moving picture shows drive the regular theaters out of business. Their fears are already beginning to materialize. The moving picture establishments are multiplying like mushrooms, while the regular theaters are less prosperous than they have been for twenty-five years. It is said that one third of the New York theaters have installed moving picture machines to save themselves from bankruptcy. The same is true of the actors. More

and more of the regular actors, many of them stars, are deserting the old time theaters and are now acting exclusively for moving pictures.

The development of the moving picture industry has advanced with extraordinary rapidity. At the beginning of the century the simplest kinetiscope was an object of great curiosity. A French artist, Meissonier, gave what might be called the first moving picture show. Certain critics had complained that Meissonier had painted horses in impossible positions. In order to humiliate his critics he displayed in rapid succession upon a screen a series of photographs of a moving horse. He secured the pictures from Muybridge, an Englishman, who had been experimenting in California. Muybridge, by means of a clever contrivance, took the pictures one after another with a separate camera for each. This was in 1871.

It is quite a way from this to our modern pictures, but the steps were taken in rapid succession. The next important development was the kinetiscope. In the kinetiscope one looked through a peep hole and saw simple moving pictures. The first pictures thrown on the screen were not very good. They attracted interest and attention merely because they moved. They were simple and inane. As the apparatus for taking the pictures was improved, the pictures began to have a little more variety. Moving pictures soon fell into disfavor on account of the action of certain concerns who began to publish indecent films. Many people then ardently opposed them. Now, however, a board of censorship has been established to which all films are subjected. Everything obscene or vulgar is rejected. There is still room for improvement, however, as many of the pictures are of a very sensational character.

The production of films has now become an enormous industry. There are thirty studios in the United States which are producing photo-plays. From Nov. 1, 1911 to Nov. 1, 1912 these companies placed 234,000,000 feet of films on the market. No expense is too great in securing pictures. Each studio has its own stock company of about forty persons. No paste-board scenery or artificial stage settings are used. The company goes directly to the scene of the play and acts it out in the actual surroundings.

Many of the films displayed in our shows depict accurately historical events and actual life. There is no place where the moving picture man does not dare to go. He penetrates the jungle, hides in the bushes near a pool of water, and takes pictures of the animals as they come to drink. He is always on hand at the scene of war whether in Turkey or in South America. Of the plays to be seen at the moving picture theaters, many are of as high class as have ever been presented on any stage. Also many worthy subjects can be presented in this way which would be in-

A MOTION-PICTURE CAMERA ATTACHED TO A LOCOMOTIVE.

*Courtesy The World's Work.*

teresting or impossible to portray on the stage. This is true of such classic themes as Homer's Odyssey. The "Return of Ulysses" is received with great enthusiasm when presented in this fashion.

Moving pictures furnish amusement and entertainment for many people who would never see the inside of a regular theater. The price of admission is only five or ten cents, in spite of the fact that often the cost of producing a single film is as much as a hundred thousand dollars. The poor man gets his money's

worth and knows it. Chief among the patrons of the picture shows are the children. On account of the people who can be reached by moving pictures they are now used extensively for many purposes besides entertainment. The state boards of education in Louisiana and Kansas and many cities have installed moving picture machines in the schools for the instruction of the children. Boards of health are using them to inform the people on such subjects as the dangers of the house fly and methods for his extermination. Opposition has so far ceased now that churches are using them for religious instruction.

What will be the future of the cinematograph can only be surmised. There is no question but that it has come to stay. There will undoubtedly be improvements in the mechanism of the machines. Whether moving pictures will ever become so perfect as to supplant the legitimate drama is a matter of doubt. Probably some sort of equilibrium will be established. It is certain that if properly conducted, moving pictures can be a force for good.

# PEAT

*G. E. Brown.*

WHEN the prophesied exhaustion of our coal supply eventually comes to pass, the question of the utilization of peat as fuel will immediately become of vital importance. This state of affairs will not occur for many years, but it is inevitable. Every year is a year nearer to this crisis, and similarly, every year sees an increase in the price of coal. Engineers have already begun to seek a substitute; and the most common and well known substitute is crude oil. Crude oil seems to be, at first thought, a solution to the problem of what to do when the coal gives out, but it is not. It has been conclusively shown by good authority that our supply of oil would be greatly inadequate to the demand. The following example will give an idea of the relative production of oil as compared with that of coal: If all the coal produced in the United States for one year should be given to a certain well known western railroad, it would last them over a period of about four hundred years; while if all the oil produced in the United States in one year should be placed at their disposal, it would last them but two years. Oil can never be substituted for coal as a fuel, because the supply can never meet the demand. This elimination of oil leaves peat alone to be considered.

There are eleven thousand square miles of land in the United States containing peat deposits, and these deposits are, fortunately, most always found remote from coal deposits. It has been estimated that these deposits contain 12,888,500,000 tons of peat. The peat beds of this country are a great and neglected resource which, if fully developed and understood, will add to the national wealth a surprising amount of good fuel. The United States is not the only country rich in peat deposits. In Ireland, the absence of coal is deplorable, because the country is particularly rich in deposits of iron ore, which lie idle because of lack of suitable fuel for smelting. A great proportion of the interior of the island is covered with vast peat bogs, varying from twenty to thirty feet in depth, and extending over a total area of about

twenty-five hundred square miles. If peat can be rendered available for fuel on an economical basis, a great future awaits this country.

According to the conditions under which it accumulates, peat may vary in color from brown to black. Its texture varies from light, spongy matter, which is porous, coarse, and fibrous when dry, to forms that are nearly devoid of structure and which, when wet, are as plastic as clay. Peat contains under natural conditions from 80% to 95% water. Dry peat contains about 67% carbon, 33% oxygen, and 6% hydrogen. There are only two-

IN OPERATION AT THE FUEL-TESTING PLANT OF THE U. S. GEOLOGICAL SURVEY, NORFOLK, VA., OCTOBER, 1907.

*Courtesy United States Geographical Survey.*

thirds the quantity of carbon in peat as is found in coal; the hydrogen present is practically the same. Peat has been shown to possess about one-half the calorific value of coal.

Peat could be produced at less danger and with a much less expensive equipment than coal, if it only needed to be dug, because it lies at, or a few feet below, the surface of the ground. It has been estimated that peat in the form of compressed air-dried blocks costs about $1.25 a ton, and properly devised and cleverly arranged machinery, together with a production on a large scale,

would considerably lower this figure. Another advantage peat has is that it contains a very small amount of sulphur and absolutely no slag. As yet, not a sufficient amount of peat has been produced in this country to form a basis for estimation of production, and all the comparisons which have been made have been referred to European production. When this country becomes interested in peat as a fuel, these comparisons will no doubt be still more favorable.

GERMAN BRIQUET MACHINE; ENGLISH MACHINE IN BACKGROUND.

*Courtesy Bureau of Mines.*

such as tramping by men or animals, compressing by machinery, treatment by the "machine process", whirling in centrifugal machines, and drying in the air. The most successful of all of these methods is the "machine process". In its simplest forms, the peat machine is very similar to the clay "pug mill" of the brickmaker. It consists of a vertical, cast-iron body, with a hopper attached above it, by which the raw peat is fed in. In this hopper revolve two shafts with bolted knives; these are provided also

Before peat can be utilized as a fuel, it is necessary to rid it of its water by some means. Various methods have been tried,

with spiral flanges to keep the peat constantly moving forward to the knives which grind it. The object of the machine is to cut, crush, and grind the constituents of all types of peat in a homogeneous, pasty mass. It is very necessary that these machines be made extra heavy in order to handle without damage to themselves stumps, sticks, stone, and other foreign matter which are often found mixed with the peat.

Peat is also made into briquettes, but this process is from six to ten times as costly as the "machine process" just described. An ingenious method of this kind has been successfully used near Lake Ontario. Instead of digging up a peat bed and drying it by one of the methods mentioned above, the surface is lightly harrowed, allowed to stand for two or three hours exposed to the sun and wind. The air-dried dust is then collected by a suction machine, resembling an ordinary vacuum cleaner. As only the dry dust responds to the suction of the machine, the material reaches the storage bins with only about 30% moisture present. It is dried and pulverized further until it only contains about 15% moisture, when it is then sent to the briquetting machines, where it is pressed into briquettes. There is no material difference between a lignite briquetting machine and the one used to press peat.

When peat is heated in a closed retort, large volumes of gas are given off. This gas burns with great heat and a bright flame. This appears to be peat's most valuable asset. It may, also, be said to be of great value as a fuel for purposes where formerly wood was used, and for which coal has not yet been successfully adapted; such as the brick, pottery, and lime-burning industries. It has been shown by experiments that alcohol, nitrates, and ammonium can be obtained from peat. Peat is also used in the making of dyestuffs, tanning material, paper-woven fabric, artificial wood, mattresses, and sanitary appliances. This shows peat to be a valuable substance for other purposes beside fuel.

It seems odd that more careful analysis of the possibilities of the country's peat resources has not been made. It has been estimated that in the last few years over a million dollars has been spent in experimentation and the erection of plants. Most all of these ventures have been unsuccessful, and in nearly every

instance the causes for failure were avoidable, and could be directly attributed to ignorance, inexperience, and faulty engineering. Putting the production of peat on an economic basis is not a task which can be mastered in a day; it is a subject which demands careful, conscientious, and analytical study from all its points.

Charles A. Davis, Peat Expert of the Bureau of Mines, says in a recent report: "The foundation of all successful development of growth of the peat industry in the United States must be through a scientific study of the occurrence, nature, qualities, and peculiarities of peat itself; and a careful and honest investigation of the status of these industries in the European countries in which they have reached a self-supporting existence."

# THE HOOKWORM IN THE SOUTH

*H. L. Wadsworth.*

THE backwardness of the South has for a long time been a point of discussion and the causes to explain it have been many. This backwardness has been attributed to malaria, the warmth of the climate, the abolition of slavery, and most often to the "poor white" class which the war left down there. Probably none of these are the true cause, but more than likely the cause is the hookworm which has affected life in China, the Philippine Islands, Central America, and many other tropical countries. The hookworm has altered the history of the South and probably has played a more important part than either slavery or war.

There is a great similarity between the effect of malaria on the Grecian Empire and the effect of the hookworm on the people of the South. They resemble each other not only in the effect, but also in the manner the two diseases were brought into respective countries. In prehistoric times the light haired people of the North invaded the Egyptian and Persian territories, which were infected with malaria. The soldiers upon returning home brought with them captives and slaves who were suffering from that malady. The Grecians not being immune from that disease, it spread rapidly over the country and robbed them of their artists, philosophers, and scientists. So it was with the South, not by bringing captives and slaves as trophies of war, but by importing slaves from Africa, it happened that the hookworm was introduced. Let us hope that the final results of the hookworm in the South will not be as disastrous as the malaria was in Greece.

The hookworm is a very minute hair-like parasite which enters the body through the pores, infections, or hair-follicles. From there they migrate to the blood vessels and are carried to the heart and thence to the lungs where they work their way into the air cells. From here they go into the bronchial tubes, crawl along the mucous membrane up to the wind pipe and then down into the intestines. This is the long and marvelous journey which the hookworm takes after entering the body of a per-

son and, according to Dr. Looss, a German investigator, it takes seventy one days to complete the journey. It is very fortunate for the patient that all the worms which enter his body are not able to complete the journey, some being caught in the lymph-cells, others becoming imbedded in the membrane and dying.

In order to realize the full importance of the hookworm, one must compare it to other diseases. The death rate of tuberculosis is greatly increased by the hookworm. This may be attri-

AN INFECTED FAMILY. A TYPICAL GROUP OF HOOKWORM PEOPLE.

*Courtesy The World's Work.*

buted to the fact that at certain stages of hookworm infection the worms crawl through the body, getting into the blood circulation and in so doing pass through the lungs. In the lungs they make numerous holes which are a most desirable place for the tuberculosis bacilli to attack. The cure for tuberculosis, now practiced most by prominent physicans, is to give the patient plenty of fresh air and lots of good food. The hookworm de-

creases the opportunity for the body to utilize the fresh air by reducing the carrying properties of the blood. It also decreases the eating capacity of the infected person by causing hemorrhages in the intestines, thickening the intestine wall, causing a catarrhal condition. Thus by the eradication of the hookworm a great step is taken towards the elimination of tuberculosis.

The hookworm also is the cause for the increased amount and high death rate of other diseases. The holes which it makes in the intestine give the typhoid bacilli a most proficient entry. It so debilitates the person that his chances for recovery are

ON THE ROAD TO HEALTH.

*Courtesy The World's Work.*

greatly reduced. The anæmic and debilitated condition of these people more than likely doubles the death rate in pneumonia. The hookworm does not only affect the death rate in these few cases, but will be found to do so through the whole category of diseases.

This frightful and ravishing disease was discovered in the United States by Dr. Charles Wardell Stiles, who took up the study of the problem and demonstrated to the astonishment of the profession that the disease was the cause for the common

anæmia of the Southern States. It was in 1902 that this scourge, was discovered, but little was known about it until 1908 when Dr. Stiles accompanied the Roosevelt's Country Life Commission. He asked if he might be allowed to join this Commission on its Southern trip and the request was granted. At the public hearings he would explain the hookworm disease and try to impress upon the people the burden they were carrying. His statements were denied and he was criticised. Newspapers stated that he was slandering the community and the Governor denounced his


THE HOOKWORM EXHIBIT AT THE NORTH CAROLINA STATE FAIR, 1911.

*Courtesy The World's Work.*

statements. It was only four years ago that the discoverer was so scandalized. Mr. John D. Rockefeller then became interested in the hookworm and gave to it a million dollars, if that amount should be needed, to finance the Rockefeller Sanitary Commission for the "Eradication of the Hookworm".

This Commission adopted a very proficient plan to help the South, using the money donated for sanitary surveys, demonstrations, and the organization of dispensaries. Sanitary surveys were made of the different states and the degree of infection published. Then the States were divided into sanitary districts

and each placed under the direction of a local physican. In these different districts were placed dispensaries which are visited weekly by a physican and his microscopist. People came from miles around to be treated. They are first examined by the microscopist and then, if necessary, the physician gives them a free treatment. The treatment is very simple, except in severe cases, usually consisting of a dose of thymol followed by epsom salts. As high as four hundred and twelve cases have been known to have been treated in one day. By this means the Commission is carrying on a most vigorous and efficient attack against the hookworm, and is no longer held back as it was four years ago.

Another cause for the increase of the hookworm disease can be alloted to the carelessness of the landlords. Most of the poor whites rent their homes and are too ignorant to realize the need for good sanitation, so they take what the landlord gives them. He is as ignorant as his tenants and never gives the matter of their welfare a thought. The Commission during its investigation met with innumerable cases of this kind and saw immediately that one step in the prevention of this disease could be brought about by the use of sanitary privies.

Rapid strides have been taken to overcome this disease which has reduced so many Americans to abject poverty and has made labor scarce and incompetent. To think that four years ago the majority of the people denied that such a disease existed and now they are willing to go any distance to be examined for it. The work which this Commission, headed by the never tiring Dr. Stiles, has accomplished is wonderful. By its energetic and devoted work, an incalculable number of lives will be saved and the South will be greatly enriched.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## ARTIFICIAL RUBBER

*A. F. Blake.*

THE idea of artificial rubber is not a new one. It has been known by chemists for a long time that it might be possible to manufacture rubber artificially. Much experimenting has been done along this line but until recently so little progress had been made that many authorities on the subject had come to the conclusion that a practical method of making artificial rubber would never be discovered. Rubber, or something very much like it, had been made, it is true, but it was impure, inferior in quality, more expensive than the natural and years were required for the completion of the reaction.

In the summer of 1910, Dr. F. E. Matthews of London put some metallic sodium in a test tube with a substance called isoprene and went on his vacation. Returning in two weeks he found a solid mass of rubber. In eight weeks' time he had pure "synthetic rubber", as he termed it. The investigation, the object of which was fulfilled by this experiment, was conducted by Mr. Alfred Strange, most of the work being done by Professor Ferbach of the Pasteur Institute and Dr. Matthews. At almost the same time Karl Harries, a German chemist, performed the same experiment and immediately proclaimed his discovery, only to be met by the conflicting claims of Dr. Matthews and his associates. Each has secured a patent in his own country. Although the English have the advantage of a slight priority, a long struggle seems probable.

In order to be a commercial success artificial rubber must be as cheap and as serviceable as ordinary rubber. It seems to have the advantage in both these respects. It is estimated that artificial rubber can be manufactured for sixty cents a pound and

Professor W. H. Perkin of the University of Manchester sets the cost as low as twenty-five cents a pound. Good Para rubber costs a dollar and thirty-five cents per pound. A method of securing isoprene cheaply has been discovered. It was formerly so expensive that rubber made from it, even if the method had been known, would have been too expensive. Isoprene can now be procured cheaply from fusel oil, a by-product of the alcoholic fermentation of starch. It seems likely, therefore, that our future automobile tires will be made from potatoes. In regard to the other requirement it may be said that what experiments have been tried indicate that synthetic rubber is superior to natural rubber. A conclusive experiment was performed on automobile tires. A motor car was fitted with two synthetic rubber tires and two of the ordinary variety. After the car had been driven at high speed for a considerable distance the ordinary tires showed decided signs of wear, whereas those of artificial rubber seemed uninjured.

If the manufacture of synthetic rubber proves to be a success it will probably become one of our greatest industries. The demand for it is most insistent. The natural source can nowhere near supply the present demand which has been vastly increased by the development of the automobile industry. This has caused the price to rise so that rubber is not used in many places where it could be used to advantage if cheaper. Also the quality of most of the rubber goods now on the market is extremely poor, only a small proportion of the material being pure rubber. It is expected that synthetic rubber will make an improvement in both these respects.

We can not expect chemically made rubber to be put on the market right away. It takes a long time to get a new thing started. A company has actually been organized in England to manufacture rubber but it is experiencing difficulties in raising capital. People are slow to risk their money in an untried industry. Then, it takes a large quantity of starch to produce a small quantity of rubber and it will probably require an enormous potato acreage to supply the starch necessary to support the industry. At the best we must expect the development of the industry to be a slow process, the law of inertia holding good even in the field of technical progress.

# THE "AIR LIFT SYSTEM"

*F. W. Schmidt.*

IN seeking a solution of the problem of city water supply we come to the conclusion that wells are the one pure source of water supply which remain. There are few districts in this country that could not be amply supplied from properly driven wells. Many cities located on rivers with gravel bed formations, find that by placing wells of suitable construction far enough back from the bank there is obtained a natural filter bed, making the water perfectly clear. Here is the water; the question now comes up, how can the water be obtained in an economical manner for city use? It is a well known fact that where there are underground flows of water, wells can be driven in rows along the vein. It is in such conditions as these, where the wells are strung out over a great distance, that the "Air Lift System" proves to be of greatest use.

Let us find out then, what the air lift system is. As its name implies, it is a method for lifting water by the use of air, and is expected to replace pumps in many places.

Opinions differ as to the true theory of the air lift. A common air lift case is one where we have a driven well in which the water has risen approximately near the surface. We place in this well a large pipe for the discharge of the water, as shown in Figure 1. This is known as an "eduction pipe". This pipe does not touch the bottom of the well, but is elevated above it so as to freely admit the water through its lower open end. Along side of this pipe, either on the outside or within, is a small pipe properly proportioned and intended to convey compressed air to a point near the bottom of the eduction pipe. It is usual to provide what is called a "foot-piece", which forms the nozzle connecting the air pipe with the water pipe, but in what is known as the "central pipe system" this foot-piece is not used, the air pipe being placed within the eduction pipe at a point near the bottom, where it discharges the compressed air into the water column.

The air pipe is connected with an air receiver which is in or near the engine room, in which there is an air compressor.

Before turning on the air the conditions in the well show water at the same level on the outside and inside of the induction pipe. At the first operation we must have sufficient air pressure to discharge the column of water which stands in the eduction pipe. This goes out at one time, after which the pump assumes a normal condition, the air pressure being lowered and standing at such a point as corresponds with the normal conditions in the well. This

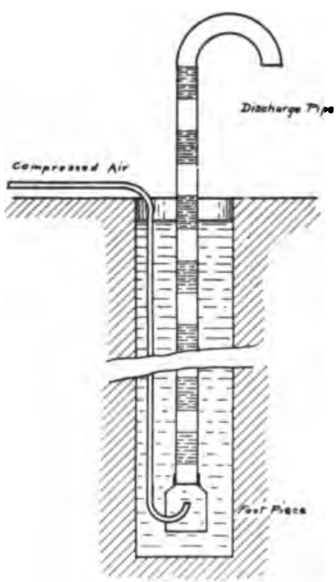



FIG. 1.

POHLE AIR LIFT, SHOWING ALTRERNATE LAYERS OF WATER AND AIR.

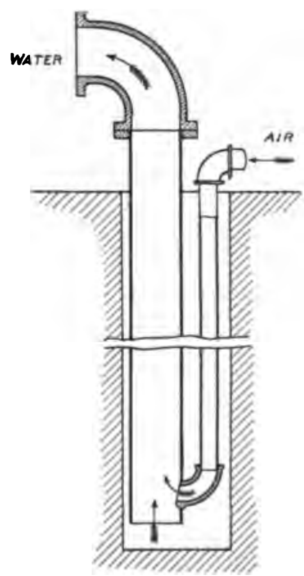



FIG. 3.

SAUNDERS METHOD OF PIPING.

is determined by the volume of water which the well will yield in a certain time and the elevation to which the water is discharged. Here comes in the value of experience in laying out the pipes, which should be proportioned to meet normal conditions.

It was at first supposed that in all air lift cases the water was discharged because of the aeration of the water in the eduction pipe, due to the intimate commingling of air and water. Bubbles of air rising in a water column not only have a tendency to carry

particles of water with the air, but the column is made lighter, and, with an excess of weight of water on the outside of the eduction pipe, there would naturally be a constant discharge of air and water. This is known as the "Frizell" system, and where the lifts are moderate—that is, where the water in the well reaches a point near the surface—it is very likely that the discharge is due to simple aeration.

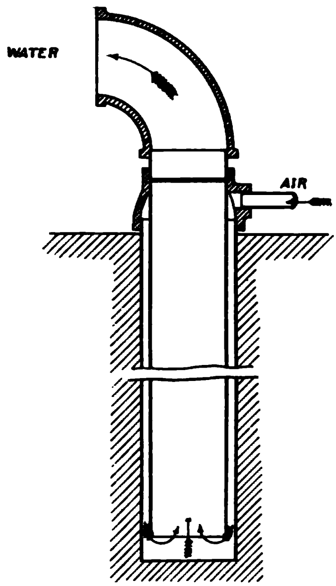



FIG. 4.

CENTRAL AIR PIPE METHOD OF PIPING.

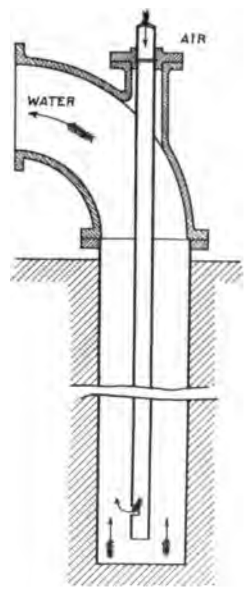



FIG. 2.

SIDE INLET METHOD OF PIPING.

Most air lift propositions are deep well cases, that is, the water is lifted a distance greater than 25 feet; and just in proportion as the lift is increased do we get away from the aerated form and reach the Pohle system of piston-like layers. To understand the distinction and the importance of proper pipe proportions let us take an exaggerated case, where we have a lift of, say, 100 feet and a diameter of eduction pipe of 12 feet. Such a case as this is impracticable and no matter how much air is discharged into this pipe it is likely to rise in the shape of bubbles, some of them

larger than others, because as they ascend they cohere, and piston-like layers can only be formed in so large a pipe as this, under conditions where there is a sufficient head or height of discharge and an enormous volume of water. In other words, the volume of water admitted to this pipe of large diameter must be sufficient to keep pace with the large volume of air admitted.

The economy of the air lift system is in direct proportion to the capacity of the well to form piston like layers, and the reason why these layers are formed is that after the first discharge there is kept up a constant struggle between the air under pressure and the head of water on the outside of the pipe, each one seeking to enter the lower end of the eduction pipe. When the air pressure is greater than the head of water, a certain volume of compressed air is admitted into the eduction pipe. The water in this pipe is at that time moving rapidly upward; that is, its momentum has been established. Hence the air takes up this velocity and goes upward with the water. If a sufficient quantity of air has been admitted in proportion to the diameter of the pipe, and if there is a sufficient pressure in this pipe to prevent the free discharge of the air, we can see how readily this bubble of air spreads itself across the diameter of the pipe in a piston-like condition. The reason why this air piston is not elongated and continuous is that the free discharge of the air, aided by the velocity with which everything in the eduction pipe is moving, causes a fall in the air pressure just sufficient to allow the head of water to press the water into the air space from the open end of the eduction pipe. In other words, as the air pressure is slightly lowered, the water pressure, which was nearly equal to the air pressure, becomes a little greater and a piston-like layer of water enters the pipe, shutting off the air. This piston of water rises in the eduction pipe with velocity equal to that of the air, and as it has plugged off the air-nozzle there is a momentary rest during which the air has a chance to accumulate greater pressure, and just as soon as its pressure overcomes that of the water the conditions are reversed and another piston of compressed air is discharged into the pipe, thus shutting off the water for an instant. This process is continuous and as regular as the movement of a pendulum.

As these pistons of air approach the surface they are gradually enlarged because of the reduced load upon them, and it is likely that before they reach the surface there is a general breaking up of the piston-like layer condition; but it is important that each plant should be installed with the idea of maintaining the piston-like layers as far as may be possible.

There are three principal methods of piping wells in the Air Lift System. Each method, distinct from the other, has its uses and will only operate most efficiently and economically under certain conditions.

In the Pohle or side inlet system, shown in Fig. 2, the air and water pipes are placed along side of each other in the well and connected at the bottom with an end-piece. This method is used when the well is large enough to allow the air and water pipes to be placed side by side from top to bottom. This system is most economical at medium and high lifts.

When the well is not of sufficient diameter to allow the Pohle system to be used, the Saunders system, Fig. 3, is used. This system has a central tube suspended inside the well. The air passes down between the tube and the well casing and the water is discharged through the central tube.

The third or central air pipe system, Fig. 4, reverses the arrangement of the Saunders type and is used when it is desired to obtain the greatest possible output for a given size of well casing, provided that the well is cased to admit a 50 per cent submergence of the air pipe which is suspended inside. The air passes down the central pipe, and the water and air discharge between the air pipe and the well casing. This is not as economical as the first two methods, but may be used where the well is very strong and a large amount of water is wanted from a few wells.

Aside from its value for raising water, compressed air lends itself with great facility to the difficulties involved in handling brine from salt wells, in raising acids, acidic solutions, and other liquids of high specific gravity and corrosive character. It can be used in manufacturing establishments for handling dye, paper pulp and fluids. In sugar refineries or any place where gritty particles and chemical solutions are encountered and for many other purposes, the air lift system has no equal. One reason for

success of the air lift system is that it increases the yield of the well from two to seven times. Its large capacity comes from the fact that there is little in the well to interfere with a continuous stream the full size of the bore hole, if that quantity will come into the well. There are no moving parts underground—simply two pipes which, when adjusted, do not need attention again for years. None of the working parts of the compressor come in contact with the water.

A valuable feature of the air lift, aside from what has already been said, is the fact that it cools and purifies the water. The water is cooled by the expanding air abstracting the heat from the water. The aeration of the water, due to pressure as the water flows upward mixed with air, causes the sulphur gas to be driven out, the iron to be precipitated and the vegetable matter to be thrown off.

Another advantage of the air lift over the pump is that the compressor may be placed in a building directly under the care of an engineer and the air conveyed in uncovered pipes to wells which may be any reasonable distance away.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

*Who's Who in Science.* (International), 1912. Edited by H. H. Stephenson. New York. The Macmillan Company. $2.00 net.

This handy volume of over three hundred pages is of special interest to those who desire to keep informed of the whereabouts and activities of the world's leading scientists in all of the various fields. It should be noted, however, that the sciences represented in this work do not include a number of branches of knowledge which are often classed among the sciences, such as Economics, Sociology, and Psychology. Nevertheless, many leaders within these fields find a place within the book in those cases where their work tends to overlap or form a connecting link with the natural sciences. The volume contains a list of the world's universities, two hundred and seventy-five pages of biographies, and an excellent classified index.

A. L. Bishop.

*Theories of Solutions.* By Svante Arrhenius, Director of the Nobel Institute of the Royal Swedish Academy of Sciences, Stockholm. Published by The Yale University Press, New Haven. 8vo. pp. 247+xx, with diagrams. Price $3.00 net, postage 20 cents.

This book contains eleven lectures delivered on the Silliman Foundation at Yale University in 1911. The author does not need an introduction to the scientific world. The fact that he is the originator of the ionic theory of solutions as well as a recipient of the Nobel Prize in Chemistry and the writer of several well known boks on Chemistry, Physics, Speculative Astronomy, and Immunity has given him a world-wide reputation.

The lectures included in this volume are not a repetition of facts already found in text books on chemistry, but rather a review of recent work and a definition of our present position on various topics concerning theories of solutions, most particularly those topics which are at present in a state of rapid development. On the other hand, older work has not been disregarded. The treatment is historical. The author believes that even those ideas which we usually think of as having sprung into existence suddenly are the results of a harmonious development that has sometimes extended through many generations or centuries.

The opening lecture is a short history of the theories of solution from ancient times. The second and third lectures deal with the modern molecular theory. Then follows a lecture on adsorption and on the use of charcoal as an adsorbent. From this the author goes on to discuss the analogy between gases and substances in solution. The sixth lecture contains a history of the author's theory of electrolytic dissociation and this is followed by a lecture on the conductivity of solutions of strong electrolytes. Lecture nine deals with equilibria in solutions. In the tenth lecture we have a masterly presentation of the objections to the ionic theory and attempts to explain these so-called abnormalities. The closing lecture deals with the doctrine of free energy in solutions. There is appended a most valuable bibliography of twelve pages. Indices of subjects and authors follow.

To the busy chemist who desires to keep pace with the recent advances made by the many workers in this field the book will be of great value. The simple and extremely clear treatment is characteristic of the author.

C. O. Johns.

* *

The Yale Scientific Monthly wishes to acknowledge the receipt of the following book, which will be reviewed at the earliest opportunity:

*Physical Laboratory Guide.* By Frederick C. Reeve. American Book Co.

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'99—Kenneth B. Schley of New York City, was married June 8, 1912, to Miss Ellen Haversham Rogers, daughter of Col. and Mrs. Archibald Rogers of New York and Hyde Park-on-Hudson. In the wedding, which was held in the St. James Episcopal Church at Hyde Park, Evander B. Schley, 1900, acted as best man.

'99—Charles H. De Saulles has left the employment of the New Jersey Zinc Company and has accepted a position in charge of one of the manufacturing departments of the American Smelting & Refining Co.

'00—Dr. Lee S. Shoninger has changed his office from 44 East Sixty-third Street to 64 West Fifty-sixth Street, New York City.

FEBRUARY, 1913

# The Yale Scientific Monthly

Vol. XIX No. 6

PUBLISHED BY MEMBERS OF
The Senior Class of the
Sheffield Scientific School
Yale University

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. FEBRUARY, 1913. No. 6

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. FEBRUARY, 1913. No. 6

## EDITOR'S NOTES.

### A PLEA FOR UNION

YALE has suffered during recent years, both in athletics and in other branches of activity, and it is the purpose of this article to point out what we believe to be one of the fundamental causes for this state of affairs. Facts have come to our attention which seem to connect this slump with a prominent evil which we choose to call party strife or discord. In short, Societies, both Sheff and Academic, are playing too great a part in the undergraduate problems of the day. This party spirit contains in it the very essence of ruin for Yale's undergraduate activities. "United we stand, divided we fall," is a well known phrase, here applicable in every sense. We are supposedly living in an enlightened age, and yet the blind spirit of the middle-ages could not be more beautifully portrayed than in the case of this "party-strife." This divided attitude breeds corruption and discord, and is fraught with fatal mistakes which have many times caused thrones to tremble and nations to sink into the dust. Vote for the best man! Why let malicious prejudice or society connec-

tions rule an election? It has always been a favorite saying at Yale that the best man wins. This can never happen unless we lay aside all personal feeling and vote as our conscience directs us. This party feeling is breaking down Yale's democracy, undermining her traditions, and is hastening her toward that abyss of a "House divided against itself." The welfare of this University, in fact, its very existence, is dependent upon the democracy and the free-mindedness of the undergraduates, and shall we jeopardize the well-being of Yale for a few paltry offices? Show yourselves to be true Yale men, and prove that you have a mind of your own; that no bait, no matter how tempting, suspended before your nose by a Society, party, or clique, can change your opinion in the slightest degree. College is only a preliminary stage of after life, when your real struggle against the world will commence. The manner in which you conduct yourself at college will surely influence your affairs in after life. If you sacrifice your self-respect now by voting or acting according to the will of certain men, you will certainly follow out that line of conduct in future years. You will always be a tool in the hands of someone else. You will be a dependent, one whose will is subordinate to and guided by the will of another. And this surely is a base thought to any ambitious Yale man! Hold your own opinions and stand by them to the last. Do not be led, but lead yourself. Take the initiative, state your beliefs with a free conscience, and maintain them by word and action against the world, if necessary. Do not be afraid to speak the truth, though it light on the highest heads, for the truth is often the hardest to hear and often constitutes the bitterest drink ever brewed. Yet, be consistent in word and thought, for inconsistency throws one open to the vilest slanders and accusations. What Yale needs is men who press on closely, who follow the hounds through hill and dale, and who, when the chase is done, enjoy that exhultation rightfully belonging to strenuous, consistent pursuit. Let Yale be a community of men whose primary object is the furtherance and upbuilding of the interests of Yale. If we join together and work with a will, if we eschew our petty prejudices and feelings, if we banish inter-Society disputes and ambitions, and mould ourselves into one vast body of men, whose

aims are the same, whose desires for Yale are the same, and in whom the spirit of inseparable "union" is everlastingly embodied, then, I say, and only then, will Yale take her lawful and accustomed place in undergraduate activities among the great universities of America.

* *

## A NEW ACQUISITION

THE news of the acquisition of the Hopkins Grammar School property as well as the adjoining property on the corner of High and Wall Streets by certain graduates, for the purpose of furnishing a suitable site for buildings which shall be devoted to Yale's extra curriculum activities, comes as a surprising and very welcome announcement. There is scarcely a person associated with any of the numerous and varied extra curriculum activities of the college who does not rejoice in the unusual gift, for such it is, and we feel that the more it is considered and discussed, the more will its great possibilities be appreciated. Not only is the property to be used exclusively for graduate and under-graduate organizations outside the regular college course, but we understand that it is more for the encouragement of organizations of this nature which already exist, than for the establishment of new ones. Thus the gift is one of great scope, which directly concerns and benefits a very large number of graduates and undergraduates.

The necessity felt in the past for just such an institution as this gift makes possible, need not be emphasized. Suffice it to say that we feel that we are only expressing the general sentiment of the undergraduates in stating that the gift is very much appreciated and that the donors deserve the greatest gratitude.

* *

## AN EXAMPLE

IT has been said that Yale is so over-run with clubs and other organizations, that the true democracy of college life is lessened. Perhaps the University would be better without some of these clubs, though if they should follow the example of the Ohio Club they might accomplish some definite end. This organization not only brings men from that state into closer fellowship, but it is helping to make the younger boys of Ohio interested in Yale. They have offered to defray the expense of entrance examination to this University to any high school boy who might otherwise hesitate to take the exams on account of lack of resources. Here is a noble work instituted by one of the sectional clubs. Let the other organizations do likewise and help the less fortunate ones to enter our Alma Mater.

* *

## WHEN AWAY FROM COLLEGE

IT is a true and at times unfortunate fact that a man's actions reflect upon his college. If while away from college an undergraduate commits objectionable acts he may do his college a great injury. Perhaps some men do not realize this. Perhaps they do not realize the extent of the harm which a few inconsiderate actions may lead to, nor the erroneous and mistaken impressions which they give to those about them.

During the past Christmas holidays a man was sitting in a railway car watching a group of college men. They were making fools of themselves. Several were slightly under the influence of liquor, and their loud talk and foolish laughter was disturbing the whole car. The man was thoroughly disgusted. He turned to his neighbor and said: "Do you see those young boys over there. Well, Sir, that is why I did not let my boys go to college. All they do at College is to fool and drink."

An unjust statement you say, and so it is. The point is that that was the impression which a man obtained who was not in

close enough touch with college life to know that what he saw was the exception. There are, moreover, many such people whose only impression of college men is based upon the actions and deportment of the men while away from college. They have no other means of judging.

If such actions are the result of thoughtlessness, we feel that after a few years in college a man ought to begin to get over some of this thoughtlessness. If a man does not soon begin to realize and respect the fact that for good or for ill he has become the guardian of the good name of his college, he would far better leave college immediately, and especially Yale

* *

## DEFICIENT ATHLETES

FEW men realize the loss sustained athletically each year by Yale due to the scholarship deficiencies of her athletes. There is not an athletic activity, whether major or minor, that does not suffer from this loss each season. Yale's requirements for eligibility are perhaps no more stringent than any other large university's, and yet Yale loses more men because of scholarship deficiency than most other colleges. There must be a reason for this state of affairs. It may be explained in two ways. The first is that Yale is absolutely impartial in the matter of scholarship; and by that we mean that the "star" stands no better chance of passing his curriculum work and remaining eligible than does the most inconspicuous candidate. The second is that absolutely no attempt is made to aid a deficient athlete to raise his standing and become eligible.

A university, whose record on the gridiron this year was worthy of great commendation, boasts of not having lost a single man of her whole Varsity Squad from scholarship deficiency. They attribute this remarkable state of affairs to the efficiency of their tutoring system;—a system which does not wait for a man to fail before he is aided, but by which he is warned of his liability to failure by his instructors while there is still time enough to

successfully put him through his work. Why not something of this nature at Yale? The method need not be as elaborate as the one outlined above. It may serve a double purpose. Instead of having officially appointed tutors, why not let the deficient man's friends, who are perhaps more fortunate scholastically than he is, devote a portion of their spare time to aiding this backward man with his work. There are innumerable men in college who are prevented from engaging in athletics by physical reasons. Here is an opportunity for such men to help Yale athletically by unselfishly devoting a portion of their spare time to coaching deficient athletes in their work. This need not be official and the quieter it is done the better will be its results. There is no doubt but that this will prove to be a solution to the difficulties now existing; and being altruistic rather than mercenary in character it is the more commendable.

* *

## A PLAN FOR EXTRA DAYS AT VACATION TIME

BEFORE the present year, it has been customary for the Sheffield Scientific School to allow its students who come from some distance, several days extra vacation to compensate for the long time spent in travelling. This year, however, this admirable plan was stopped. It compelled men from the far West, or from the South to spend between a third and a half of their vacations on the train. It seems as though some sort of allowance ought to be made to the men who, in their desire to come to Yale, forego the advantages and comparative inexpensiveness of the colleges nearer their homes.

The fairest way to arrange this extra time would be the establishment of a zone system, similar to that of the parcels post, and the allowance of a fixed number of extra hours, according to the zone to which the student is obliged to go, in order to get home. Such a system would put all the students on an equal footing as regards vacation, and would eliminate constant petitioning at the office, and much discontent.

## MINOR ATHLETICS AGAIN

IN the winter term the majority of the men in college allow their enthusiasm as regards athletics to wane. Of course it happens that in the fall and spring all the so-called major sports take place; but, on the other hand, there is a wider variety of sports in the winter term. Hockey, Basketball, Swimming, Gymnasium, and Indoor Track are assigned to this term. In the last few years, the attendance has left much to be desired, with the possible exception of that at the hockey games.

Let us each try to see some of these games or meets. The men who represent the college in the major sports work little harder than those who represent Yale in the minor athletics, and get much more credit and honor. We surely owe something to all our athletes. A great deal of time is wasted in the afternoons and evenings of the winter. It would be better for the participants and for the spectators alike if more men could find the time and inclination to turn out and show their appreciation of their college's minor teams.

* *

## WEDNESDAY NIGHT MEETINGS IN BYERS HALL

EVERY Wednesday evening Sheff men have the opportunity of hearing excellent speakers talk on subjects which are of great value for their educational interest as well as for their moral influence. The men selected to speak are generally widely known, and would draw immense audiences in any city in the country, though the general impression about college is that thirty minutes spent at the "movies" would be more interesting than the same amount of time at the Wednesday night meeting. Those who have heard "Sky Pilot" Higgins, however, tell of the efforts to improve the conditions in the northern lumber camps, or Roswell Bates talk on life in the New York slums, realize that these meetings are a source of information as well as a chance to get in touch with some of the deeper lessons of life. Most of the

men who speak in Byers Hall have met life in all its phases, and have had countless valuable experiences which we may profit by, and the knowledge gained from them will make us better fitted for handling men in our later life.

It is not expected that every man will go to every meeting. However, each man should go to some of the meetings for his own good. Special efforts have been made to secure men who would particularly interest college fellows. Pick out the men whom you think you would like best, go to hear them, and soon you will be going to all the meetings. The average weekly attendance last year was ninety-eight. More men should avail themselves of this opportunity, for such it is.

* *

## ATHLETIC CUTS

NOW that the minor athletic teams are in the spotlight and are holding our attention, it seems to be an opportune time to discuss the relations of these teams to the Sheff faculty. In other words, we wish to discuss the stand which the faculty of Sheff takes toward the men who are engaged in our minor athletics. Although it is hard to realize, it is, nevertheless, a fact that, officially, our faculty do not recognize minor athletics at Yale, except in cases where a man is deficient in his studies. By recognizing these sports, we mean granting them the privileges which our major sports enjoy. The faculty do not excuse the cuts necessitated because of minor athletics. A man engaged in one of these sports must bear the burden of all cuts which he is forced to take while representing the University.

To us this does not seem consistent, inasmuch as the faculty interest in the minor sports is extended only on the negative side: the debarring of men who do not keep up in their school work from participating in athletics.

A man who plays on a Yale team is representing the University. The man who plays on a minor team is representing Yale equally as much as one who plays football or baseball. The fact

that the major athletics attract a larger crowd and draw forth more newspaper talk is no reason why our faculty should extend privileges to them which less popular sports do not enjoy. A man taking part in minor athletics works just as hard as one engaged in a major sport, and he does the University just as much good as any other athlete.

It seems that these minor sports should not be considered according to their relative importance and popularity, but that all athletics should receive equal recognition and equal privileges.

* *

## THE YALE ENGINEERING EXHIBIT

THE Yale Engineering Exhibit will take place in the Mason Laboratory on February 21st and 22nd of this year. Its twofold purpose will be to show what kind of work the men in the Engineering Courses are doing, and to afford an opportunity to those interested to inspect the Laboratory.

A very small proportion of the men in college, outside of those who actually have classes in the Mason Laboratory, have any idea of its equipment. This exhibition will enable these men to inspect the Laboratory and have the workings of its machinery and general equipment explained to them. A feature of these explanations is that they will be in language as far as possible free from technical terms. Squads of capable men will have charge of the different machines and it will be their pleasure to explain the mechanism to the public.

This exhibition should prove very interesting, not only to the undergraduates, but to all outside friends of Sheff and to the Connecticut manufacturers. There has been a great advancement during the past few years in the engineering courses and this exhibit should be of value as demonstrating that fact.

The success of the exhibition depends upon the number of those who attend. Everyone who is at all interested in engineering should endeavor to go and help the men who are working

hard for its success. Professors Breckenridge and Scott wish to interest not alone the undergraduates, but also the business men and manufacturers. Let us all do what we can to make this exhibition a success.

* *

## COMMUNICATION

THE SCIENTIFIC MONTHLY invites communications, but does not hold itself responsible for the sentiments expressed therein.

*To the Scientific Monthly:*

Exclusion from final examinations of men who have failed to maintain a high stand in their work during the term is unjust. It is claimed that a man who does not maintain a high stand is not earnest in his work and therefore does not deserve the privilege of an examination, but must arbitrarily repeat the course the ensuing year. Paying the tuition fee of the School should entitle a man to take every examination offered to his course depending not upon which end of the class he may stand. A man whose work is low should be given a chance to flunk rather than be excluded, which is, exactly, being flunked without a chance. To exclude a man is to discourage him; and there is nothing which so dispirits us all as being condemned without a fair trial. A man's term work preceding an examination is doubtlessly a test of his ability, but it is not always a fair test and it is never a final one. Countless contingencies may occur during a term which will lower a man's stand appreciably; he may be neglecting this course temporarily for one which to him seems more important as referred to his future; he may have difficulty in grasping its central idea until well on in the course; absence may be responsible for his poor showing; or a poor start; there can be found many reasons such as these. And on the other hand, many times a low stand results from pure slothfulness; perhaps a few more times than the justi-

fiable causes. Granted that the unjustifiable causes are in the slight majority, should the law be made to affect all without just and fair discrimination. For all members of a course to take an examination means only a few more books to correct; and the added labor necessary for the correction of the books of the men who have heretofore been excluded is too small a matter to be offered as an objection. Give a backward man a final opportunity and it will be surprising in how many cases a man will succeed in passing. Final examinations should be held for all, irrespective of their scholastic standing; we are entitled to them and the privilege should not be denied us.

1913 S.

*To the Chairman of the Yale Scientific Monthly:*

As is well known to all undergraduates, when an upperclassman succeeds in getting a mark of 300 or better in a subject during a term, he is excused from taking the examination in that subject. This is not the case, however, in every subject. The Junior Selectmen may be excused from everything except modern languages; the Senior Selects and the men in the Engineering and other courses from not so many. The system has worked out very well from the point of view, not only of the student, but also of the instructor. A man who has formerly been content to merely pass, now exerts extra efforts. The incentive afforded the student has caused many men to do their best and not merely to try to "get by."

However, no matter what grade a man makes he is not excused from taking the examinations in the modern languages. Of course there is the satisfaction of doing one's work well, but, on the other hand, the difficulty is, that for the average man it is easier to spend but a little time on his languages than on his other subjects. In many ways, especially to the Select man, no other subject is more important than some sort of knowledge of some of the European tongues.

It seems as if it would be a good thing to extend the excusing from exams to include the languages. An incentive for work would be created and the standing of men in the courses probably would be raised.

# THE HONOR SYSTEM OF THE UNIVERSITY OF VIRGINIA

THE twenty-seventh annual meeting of the New England Association of Colleges and Preparatory Schools was invited by the University to be held at Yale this year. At this meeting, held in Lampson Hall on November 1st and 2d, the subject of Student Honesty was discussed. Representatives from Yale, Princeton and Virginia spoke on the honor system from the view point of the student, as carried on in their respective colleges. Mr. W. S. A. Pott, '12, of Virginia, delivered an exceptionally good paper on the system as executed in his school. This address is especially interesting, as Virginia was the first American University to adopt the honor system, and is the mother of all other honor systems. It was installed in Virginia in 1842.

Mr. Pott spoke as follows:

"It is indeed a difficult task to show in a limited space of time how an abstract principle, such as honor, becomes an organic and concrete fact in the life of the University of Virginia. I think it will conduce to clearness, if, at the very outset, we put ourselves on guard lest we confound the mere mechanical and administrative part of the system with the underlying sentiment which is its *raison d'etre*. The details of the administrative phase are not the be-all and end-all of the honor system, but only serve to regulate a system whose foundations are laid in something deeper than mere conventional ruling. Many other institutions have patents on other machinery, but the difference is unessential, for all must utilize the same force of human nature and be impelled by the same dynamic power.

'With this in mind, my task will be to show how student honor is eminently successful for, and vitally necessary to, the welfare of our university.

"The honor system, as it now exists at Virginia, is but the natural outgrowth, and living embodiment of certain passages in Thomas Jefferson's ideal of academic discipline, which he expresses in the following words: 'The best mode of government for youth in large collections is certainly a desideratum not yet attained by us. It may be well questioned whether fear, after

a certain age, is a motive to which we should have ordinary recourse. The human character is susceptible of other incitements to correct conduct more worthy of employ and of better effect. Pride of character, laudable ambition, and moral disposition are innate correctives of the indiscretions of that lively age, and when strengthened by *habitual* appeal and exercise, have a happier effect on future character than the degrading motive of fear. Hardening them to disgrace, to corporal punishment, and servile regulations cannot be the best process for producing erect character. The affectionate deportment between father and son offers, in fact, the best example for that of tutor and pupil; and the experience and practice of other countries in this respect may be worthy of inquiry and consideration with us. It will then be for the wisdom and discretion of the visitors to perfect and prepare a system of government, which, if founded in *reason and comity,* will be more likely to nourish in the minds of our youths the combined spirit of order and self-respect, so congenial with our political institutions and so important to be woven into the American character."

"These then, were the seeds of the honor system, which bore fruit some years later in the following resolution, presented in 1842 by Prof. Henry St. George Tucker of the faculty, and immediately adopted: 'Resolved, That in all future written examinations for distinction or other honors of the university, each candidate shall attach to the written answers presented by him on such examinations, a certificate in the following words: "I, A. B., do hereby certify upon honor that I have derived no assistance during the time of this examination from any source whatever, whether oral, written or in print, in giving the above answers."' Since then the form has been slightly modified, the pledge now reading, 'I hereby certify upon honor that I have neither given nor received assistance on this examination,' which pledge is appended to all written quizzes and examinations at Virginia.

"Concerning the early successes and failures with which the resolution of 1842 met, I am not prepared to speak for lack of information. But the fact that the substance of it has remained with us for seventy years is evidence that the honor system is

not a vain chimera, but a very practicable and feasible thing. Of this I shall have more to say in its proper connection.

"With such a pledge as we now have, implicit confidence is placed in the student, and (to speak of the honor system in its connection with examinations) the need of professors, proctors or any other officers in the class room during the examination is no longer felt. The Professor goes in and out as he chooses, his presence being required from time to time only in order that he may clear up those obscurities that are almost invariably associated with a series of questions. Furthermore, the student himself goes in and out as he chooses, but as no man is above suspicion, if the student intends to absent himself for any length of time, or to visit any such unfrequented place as his own room, he usually requests someone to accompany him during the absence.

"At this point it is vital that a possible objection be answered. Is not this total freedom that the student enjoys likely to be abused? If you will pardon a personal allusion, I once had an occasion to explain our honor system to a student of one of our larger universities. When I had completed what I thought was a satisfactory exposition, my friend turned to me and said, 'That's fine. We have nothing like that.' 'Yes,' I said, 'that is fine.' 'But don't you cheat at Virginia any way?' was the question put to me. So I found that we were judging the merits of the system from totally different points of view. My friend extolled the system because he thought he saw in it an increased opportunity for underhanded practice. In fact, he was paying a tribute to what he thought was the ingenuity of our students. What security then, can we offer that our pledges are strictly observed?

"The first safeguard, though not a tangible one, is yet a very powerful one and rests on the empirical principle that to trust a man is to make a man worthy of your trust. The generally friendly terms on which professor and student stand at Virginia are perhaps the result of the assumption, on the part of both, at the very outset, that each is man and gentleman, and this mutual relation of trust and friendship, in my mind, is one of the chief guarantees of our honor system and the fulfillment of Jefferson's

ideal of student government, which he says, 'if founded in reason and comity will be more likely to nourish in our youth the combined spirit of order and self-respect.' This feeling on the part of all, that everyone is to be treated as a man and a gentleman, in fact, 'as an end in himself', renders impossible any two codes of ethics totally divergent, one of which is to be observed in general life, and the other only in the narrower domain of the class room.

"I know that 'cribbing' is felt by some to be, if not a justifiable, yet a venial offense when the professor or certain other agents are present for the specific purpose of espionage; and therefore the whole question is narrowed down to a mere contest of vigilance, in which the side that has the majority usually wins. But be that as it may, suffice it to say that the honor system and the open and amicable relations between faculty and students at Virginia are two things so inextricably connected and reciprocably related, that it is impossible really to discover which is cause and which is effect; and this relation prevents any practices in the class room different from those employed in a larger sphere. It seems to me that this very fact of our student *consistency* discountenances the statement once made that 'Honor is too sensitive a sprite to be called upon on daily or routine occasions.' Surely it would be paradoxical and a contradiction in terms to say that a gentleman should not be taken at his word as soon as he enters the narrow confines of the lecture hall. To say that the habitual telling of truth, whenever the occasion demands, makes a man less the gentleman, is a statement based on a misconception of the psychology of nervous habit, and finds no support from theory or facts. In fact, so far from taxing the strength of this delicate sprite, constant practice and exercise in truth-telling only serves to invigorate it and to harden it against the sometimes tempestuous onslaughts of temptation.

"But, lest we prove unfair to the gentleman from whom I have quoted, there is an element of truth in his statement which we should not fail to grasp. It must not be supposed that the observance of the honor code is or should be synonymous, or coextensive, with perfect or ideal conduct. It must not be supposed that an honor system is a panacea or antidote for all the different attacks of moral illness that a student body suffers. The

presence of such a system *does not* insure the Utopian happiness and ideal goodness of a Platonic Republic. I know that there are certain unreasonable extremists amongst ourselves who would like drunkenness to be considered as a violation of the honor system, and worthy of the capital punishment of expulsion in *disgrace* and *dishonor*. But to use a homely simile, just as rubber stretched too much looses its quality of elasticity, so, I am sure, that such a radical and far-fetched conception of the just limits of the honor code would be destined to work disaster. Our system is as elastic as such a system could be and any attempt to render it more so would be wrong, unwise, and a total failure. Of such an offense as drunkenness the faculty assumes control, and if it be the first time that the student is arraigned on such a charge, he is usually allowed to sign his name to a pledge of total abstinence so long as he remains a student of the University of Virginia. But it is to be carefully noted that, should the pledge be broken, the thing ceases to be a faculty affair and becomes a student affair. In other words, the students and the honor committee have no authority over such matters as drunken conduct, but they have complete authority in all matters involving a breach of good faith.

"I have been compelled to dwell at length on certain questions that are related to, and developed from the statement of my first thesis, namely: That frank and friendly relations between professor and student is one of the strongest guarantees for the successful operation of our honor system. But I must hurry on to our second safeguard.

"Our second safeguard rests in the fact that any offender of the honor code, when detected by another student, is reported by that student. Now this very fact that one student should report another is generally the storm center around which a discussion of the honor system is waged. Some feel that student-reporting is certainly an ignoble means for insuring the successful operation of a system, however meritorious and laudable that system may be in itself. However, all this dispute seems to me to arise from the failure to obtain a correct idea of what tale-bearing really is. Tale-bearing, or 'squealing', is a word that should be used to designate the reporting of a strictly personal or man-to-man af-

fair. Perhaps you will understand my meaning better by a simple analogy from civil life. If, for example, I detect an incendiary in the act of setting fire to a building, surely there would be no moral turpitude in my reporting the man. But if I am done some personal injury by another I would be considered a coward if I did not seek to manifest my resentment in some personal and private way, without calling in the aid of others. So it is in the smaller sphere of our university life. Just as an incendiary threatens the best interests of society and is a menace thereto, so the student who cheats pollutes the fair name of our university and threatens to undermine the very foundation upon which its student life is built. Looked at in this light, we do not consider testifying against a cheat as tale-bearing. Viewed in its full aspect and context, student reporting of cases of dishonesty, so far from being condemned as an *opprobrious* act, is considered as an absolute duty, and therefore a *meritorious* act. In other words, we dismiss any violater of the honor code at Virginia in accordance with a principle that Gibbon recognized when he said, 'It is the undoubted right of every society to exclude from its communion and benefits such among its members as reject or violate those regulations which have been established by general consent.'

"But it may be very naturally asked, why, if student self-protection exists in the case of lying, is it not also extended to other fields? Why, for example, does not one student report another for drunkenness? Does not drunkenness also bring ill repute on the name of an institution, and should not the student be justified in reporting a drunkard on the same grounds that he is justified in testifying against a liar?

"To begin with, the honor system, as I have shown before, comes into play only where there is a promise made and broken, or some other form of dishonesty has appeared, and to extend its jurisdiction any further would be, if nothing else, a misnoma. I do not wish to appear to be mounting the pulpit, but I am sure that you can respect a man who has forgotten, momentarily, that 'there is a just measure in all things,' and cannot respect one who has lied to you. In all the history of civilization and morals a lie has ever been considered the meanest and basest of vices.

In fact, truth and honesty have ever been the *sine qua non* of a society or of nations. It is not necessary to go further to show the importance of truth. We feel at Virginia that if the consciousness of mutual trust is lost, if the students' feeling of self-respect is gone, if the keen reverence for truth is destroyed, then chaos must rule and the impotent aid of faculty supervision must be called in.

"Do not think that I am condoning drunkenness, or any other such fault, or that the faculty fails to detect and deal promptly with a drunkard. But, in such cases we feel that for a student to take any action other than that of counsel and persuasion, is to infringe on another's personality. We have not reached that stage in the progress of social evolution, in which each and every man regulates or can regulate his own entire conduct in accordance with correct social considerations. This is no doubt an excellent standard for one to set himself, but to force it on mortals of the present day, and to inflict severe penalties on those who fail to observe it, would certainly be a *regress* and not a *progress* in ethical theory; for moral conduct would no longer be a personal thing, but an artificial and external thing, whose chief corrective and guarantee would be the police patrol of fear.

"However, I have been occupying your time merely with a possible objection, which I have tried to answer and which does not in any way invalidate the honor system as we have it. Whether you accept my explanation or not, the honor system as such, and in its present operation remains successful and intact. Perhaps the objection cited, namely, that the system is not comprehensive enough, or is not thoroughly consistent, might with some plausibility, be urged against the frailty of human nature, but certainly not against the honor system as you and I understand it.

"I have given you what seem to me to be the two great safeguards against the abuse of the freedom and confidence that we enjoy. To repeat them, they are, first, the mutual trust and friendship between professor and student, and second, the lofty compulsion that the students feel to report all cases of dishonorable conduct. In this connection allow me to quote from a statement made by the dean of our law department, in an address delivered in 1910 before the Association of American Law Schools

at Chattanooga, Tennessee: 'I have been in residence at the university, and in intimate contact with its students' life for nineteen years. During that time, I have known of less than a score of accusations made from all departments of the university. During a connection of seventeen years with the law school, as teacher, and for a greater portion, as dean of that department—within which the total attendance of law students has exceeded two thousand—there have come to my knowledge less than a half dozen instances of the charge of suspicious conduct on the part of a law student.'

"This is surely evidence enough to refute the position of those who make a very natural distinction between the *desirability* and the *practicability* of the honor system in the American college. It is also evidence enough to disprove the statement that a degree received under a system of espionage is of more value than one received under the honor system, as if the very fact of espionage gave to the degree a sort of certified check stamp of validity.

"But few and infrequent as honor violations are with us, they yet nevertheless occur, and I must tell you how we deal with such breaches.

"We have nothing at Virginia that corresponds exactly with your class divisions. For reasons that it is not necessary here to discuss, our divisions are only into departments, such as the college, the department of graduate studies, and the departments of medicine, law and engineering. Each department has its officers, and the five presidents of the several departments, together with the vice-president of the department of which the accused is a member, constitute the honor committee. If any student is suspected of cheating and there be sufficient evidence for a *prima facie* case, the accused is summoned to explain himself. He may, or may not, remain in college long enough to be asked to appear before the committee, for he is usually warned and advised by whomever he is detected to depart immediately from the university. But if he does appear and fails to explain himself, he is simply asked to leave, and he does so on the very next train. There is no case on record in which a convicted student has failed to comply with the request of the honor committee. The accused, however, on being asked to clear himself may demand a

regular trial, either public or private. So far as I know, there have been but two public trials at Virginia, both, as I understand, solemn and heart-rending occasions. At one of these the accused was convicted and dismissed, while at the other the accused was acquitted, being found guilty only of indiscretion. But the verdict of a jury sitting at a public trial is obeyed as promptly as the request of the honor committee sitting in private.

"All this, you see, is quite simple, and the chief thing to be noted is that the students themselves have absolute control in the administration of the honor system. It is regarded by them as their dearest possession; the center of gravity, so to speak, is shifted from the faculty to the student body, which is entrusted with, and has complete authority over what it considers a priceless heritage.

"It may be thought by some, that the summary punishment that is meted out to any offender of the honor code is not altogether deserved in the case of those who fall through ignorance. It is impossible to make any distinctions or to recognize any such excuses, for the honor system itself is at stake as soon as it starts to make exceptions. Nevertheless, for those who are not familiar with the honor system before they enter (it is in operation in several of the schools that supply us with students) ample opportunity is afforded them to become acquainted with the system. It is explained by older men to all new students at a sort of mass meeting on the first Monday night after the opening of the session. With this and with living in an atmosphere that is permeated with the spirit of student honor, any offense that may occur is considered unpardonable and treated as such.

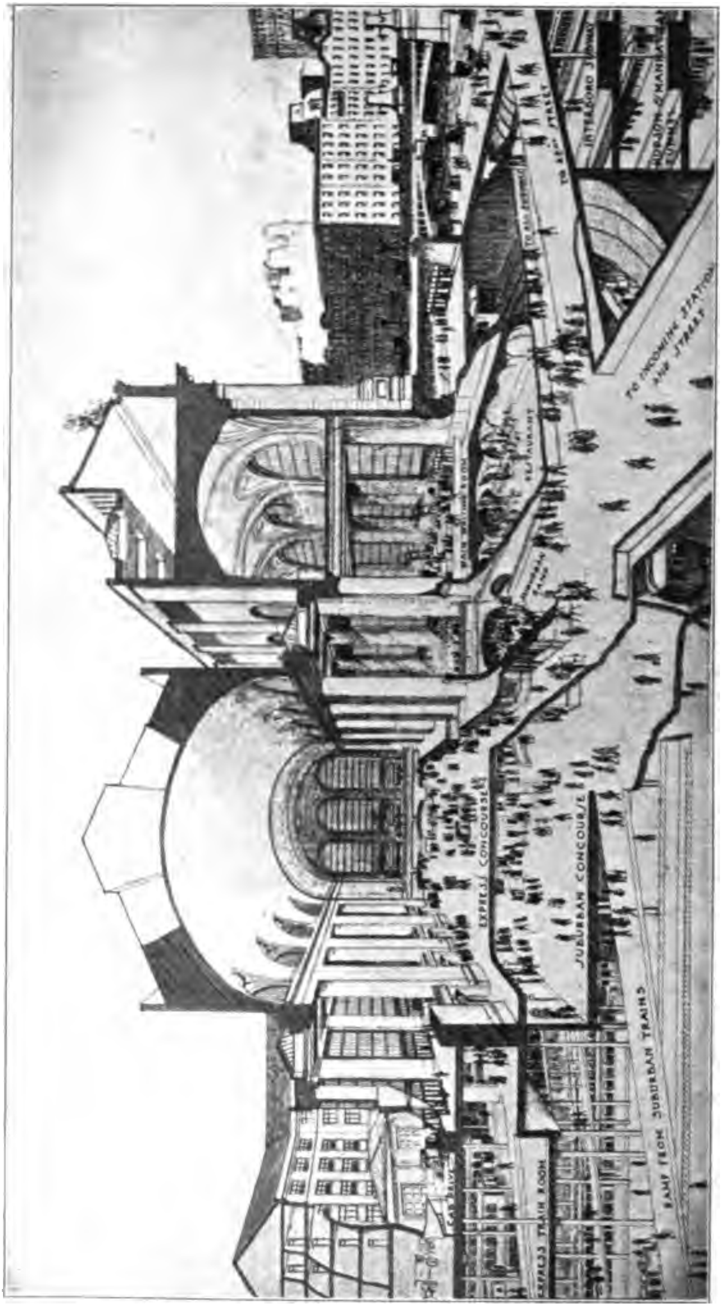
"I have taken up most of your time with a consideration of the honor system in its relation to examinations, but I would not have you think that it is such an unelastic, narrow and stereotyped thing as to be confined only to the class room. In athletics it is chiefly prominent. All of our training is regulated by pledges signed by every applicant for a team. To take another example, every member of a team, say the football or baseball team, must, before he can represent the university, fulfill the strict requirements placed upon him and sign a pledge to that effect. A pledge signed dishonestly is treated in the same way

as a violation of the examination pledge is treated. Since the eligibility rules were made, there has never been a case of an athlete signing the eligibility pledge falsely.

"To cite another instance of the comprehensiveness of the honor system, although it may sound strange to you when I say it, the honor committee takes charge of any form of dishonesty in gambling, whether it be actual cheating or the writing of bogus checks. However much the students may frown upon gambling, they lead no active crusade against gambling *as such,* but only against *dishonesty* in gambling. However much the students may deplore gambling, drunkenness and other forms of intemperance, yet a lie is considered by them as the blackest of vices, the most certain indication of a base character, the surest index of elemental viciousness.

"In conclusion, my plea, if I may be allowed to make a plea, (and the plea of every student at Virginia) is *not* that there may be *more* honor or honesty among the students of those institutions that have not yet adopted the honor system, but that the province of honor in those institutions may be enlarged so that honor may become the pivot around which the whole of the student life will revolve, that it may occupy the focal position in the consciousness of the student body, that it may be, so to speak, the energy of central heat that radiates itself in all directions and renders more genuine and congenial the atmosphere of the institution to which you belong."

Mr. Pott's speech was taken from the January issue of *Education.*




GENERAL SECTIONAL VIEW OF THE GRAND CENTRAL TERMINAL.

AT THE LEFT ARE THE EXPRESS AND SUBURBAN PLATFORMS, WITH INCLINES LEADING TO THE RESPECTIVE CONCOURSES, WAITING ROOMS AND RESTAURANTS. AT THE RIGHT ARE THE STREET SURFACE LINES AND THE INTERBOROUGH, HUDSON AND MANHATTAN, AND BELMONT TUNNELS, BY WHICH THE TRAFFIC IS DISTRIBUTED THROUGHOUT GREATER NEW YORK AND JERSEY CITY.

*Courtesy Scientific American.*

# THE NEW GRAND CENTRAL TERMINAL

*A. F. Blake.*

THE New Grand Central Terminal in New York City, now nearing completion, is justly calling forth the wonder and admiration of the world. This building is not only the largest of its kind in the world and a notable architectural success, but will be when completed unsurpassed in efficiency. But more remarkable than the structure itself is the feat of engineering which produced it. It ranks with the Panama Canal as one of the greatest achievements of modern times.

Briefly, what had to be done is this. The old terminal, once considered a very remarkable structure, and the old train shed had to be demolished and the debris removed, forty-six and a half acres of land had to be excavated to an average depth of forty-five feet to provide for the two underground train levels, and then the new terminal had to be constructed. All this had to be accomplished without interfering with the regular train service. When one realizes that over four hundred trains, carrying seventy thousand passengers, pass in and out of the terminal every day, he readily perceives that the engineering difficulties must have been enormous. The buildings were demolished during the day and at night when regular traffic slackened, work trains carried away the debris. The old train shed had to be torn down while all the rushing traffic went on directly beneath. From this alone were carried away 1350 tons of wrought iron, 350 tons of cast iron, and 90,000 square feet of corrugated iron and 60,000 square feet of glass. The excavating amounted to 3,000,000 cubic yards. Two-thirds of this was through solid rock. This necessitated blasting, which, of course, had to be accomplished without incurring danger of destroying tracks, crowded trains, or buildings. That these and other seemingly insurmountable obstacles have been successfully overcome is a great credit to modern engineering.

The area of the terminal, including both track levels, is seventy acres. To purchase outright such a tract of land in the heart of

Manhattan would have staggered even the wealthy New York Central. However, instead of further crowding and inconveniencing the business center of New York, the new terminal, although so large, will relieve it. The old terminal blocked the area between Forty Second and Fiftieth Streets between Lexington and Madison Avenues so that no streets traversed it. The electrification of the railroad, with the consequent elimination of smoke, has made it possible to put all the thirty-two miles of tracks, necessary at the station, underground, to do away with the old train yards, and to restore above the tracks the streets which formerly traversed this area. From this exceedingly valuable piece of real estate which has been reclaimed, the company

THREE STAGES IN THE CONSTRUCTION.

TO THE LEFT IS A COMPLETED SECTION OF THE EXPRESS LEVEL. IN THE CENTER EXCAVATION IS IN PROGRESS. TO THE RIGHT IS A SECTION OF THE OLD YARDS. TO THE REAR ARE THE NEW POST OFFICE BUILDING AND THE OLD TRAIN SHED.

*Courtesy Scientific American.*

expects to get a handsome return for the enormous amount of money which it is expending in the enterprise. The buildings to be erected in this section will include museums, hotels, business blocks, theatres, clubs and other structures. One hotel in particular is to be built which will cost $5,500,000. It will be twenty-three stories high, contain more than one thousand rooms, and accommodate 1,200 guests. All these buildings will harmonize in architecture with the station itself. There will be but two chimneys in the whole area of thirty-two blocks. Instead of the old, unsightly yard, with its noise and dirt at this part of the city, there will be a beautiful building, improving greatly the appearance of the neighborhood.

Architecturally, the new terminal is unsurpassed. The effect is one of grace and dignity. The front is of white marble and will have the central part of the facade in the form of a triumphal arch ornamented with statutary. The station at the street level is 600 feet long, 300 feet wide, and 105 feet high. The express train waiting room is 200 feet high. There is no one of the great terminals of the world that surpasses this one in the conformity of its architecture to the purposes of the building.

No pains have been spared in making the terminal convenient for the public. Conveniences are arranged progressively: first, the ticket window, then the Pullman, baggage, etc., so that no time is lost and no steps retraced. Passengers will not have to visit the baggage room. The cab drive is easily accessible. There are no stairways, but the train levels are reached by elevators and inclined ways. There is a so-called "Kissing Gallery" conveniently situated for persons to meet expected friends or relatives. The dressing rooms will be particularly appreciated by commuters.

The terminal will be the last word in efficiency. There are four different levels, first, the gallery, then the great concourse on the same level as the forty-one express tracks. The twenty-seven suburban tracks are on the third level, and the subways for handling baggage on the fourth. There are twelve entrances to the station to avoid congestion. The outbound and inbound traffic have been carefully separated. The train capacity has been enormously increased. Formerly all trains entering the terminal had to pass through a four-track tunnel to get into the train yard, and then back out to be prepared for the next trip. This doubled the traffic through the tunnels. Now, with more space available the trains will continue around a loop to one side of the station yard where they will be cleaned. An electric signal service has been installed. These are some of the factors which make this new terminal a monumental gateway to the city of which New Yorkers may well be proud.

# THE CONTROVERSY OVER PANAMA CANAL TOLLS

*Brice Bowman.*

NOW that the Panama Canal is rapidly nearing completion, questions concerning the conditions under which the canal may be used by vessels of commerce and war, provisions for its protection from disease and war, and for its civil government, and the administrative authority under which these two subjects will be dealt with, have come before the American people.

Because of its effect on our relation with the world at large, the most important of these questions is that which deals with the conditions under which the canal may be used, namely, canal tolls. On May 23, 1912, the lower House of Congress passed, by a vote of 147 to 126, a bill which favored making the canal free to all American shipping. The Senate, however, modified the bill so as to admit only American coastwise vessels free. Both the original and the modified form of the bill brought a storm of protest from the English Government; it being maintained that the Hay-Pauncefote Treaty had been violated.

The Hay-Pauncefote Treaty was negotiated between England and the United States in 1901 and ratified and proclaimed in 1902. The section which England claims has been violated reads as follows: "The canal shall be free and open, in time of war as in time of peace, to the vessels of commerce and war of *all nations, on terms of entire equality*, so that there shall be no discrimination against any nation or its citizens or subjects in respect of the conditions or charges of traffic or otherwise."

England maintains that according to the treaty the United States is discriminating unfairly in favor of their own ships, and that the question should be submitted to The Hague Court of Arbitration.

Whether the toll controversy is arbitrated or not depends entirely upon the way Congress regards it. If it is arbitrated, it will be under the General Arbitration Treaty of 1908, of which Article I provides that no questions are subject to arbitration that affect the vital interests of either party to the treaty. Accord-

ingly, Congress must decide whether questions concerning our coastwise shipping are purely domestic questions which concern the United States alone, or whether in some remote way Great Britain might have some concern in them.

The President has put the matter before Congress and has advised that it be arbitrated, but by a special court made up of an equal number of American and English jurists rather than The Hague Tribunal. Mr. Taft holds the opinion that, as the question of Panama Canal tolls is one in which all Europe is interested, it would be difficult to obtain an unprejudiced jury at The Hague.

ZOOLOGICAL AND BIOLOGICAL LABORATORIES OF YALE UNIVERSITY.

# THE PREVENTION OF MISSISSIPPI FLOODS

*H. L. Wadsworth.*

THE Mississippi and its tributaries afford an outlet to the Gulf for nearly all the rain and snow that falls between the Rocky Mountains and the Appalachians. The lower Mississippi has been graphically described to us by Arthur Buhl as the mouth of a great funnel which yawns across the continent, collecting all the water within its reach, and then pouring it down the narrow spout. In May, 1912, this spout sprung a leak and caused a great deal of loss and suffering. Reports came flying from the South, telling of the thousands who were homeless and without food, and how thousands had lost their lives in the muddy whirlpools of the raging Mississippi. It has been estimated that the loss from this flood, aside from the loss of life, was between one and two hundred millions of dollars. There are many other statistics which show the pecuniary loss to be enormous. Millions of acres, which contain the richest soil in the world, needing proper and permanent protection, were made useless by these floods.

The flood of May 1912 is by no means the only one which has caused much destruction in this fertile valley. In 1907, there were three floods at Pittsburg which resulted in a property loss of six million five hundred thousand dollars. The yearly floods of the Ohio mean a loss of large sums of money. All the large cities situated upon the banks of the Mississippi and its tributaries experience frightful losses and untold sufferings.

These destructive floods of the Mississippi are of perennial occurrence, and if the present system of their prevention is not improved upon, the seriousness of the floods will become increased. The now existing method of prevention, by construction and maintenance of levees, seems inadequate, and even antiquated, when considered as the only defence against the river. The constant rise of the high water mark has necessitated the building of the levees higher and higher in order to prevent these floods. For instance, the levees at Carrollton bend in 1800 were nine feet above the surrounding country; in 1893, the water reached the

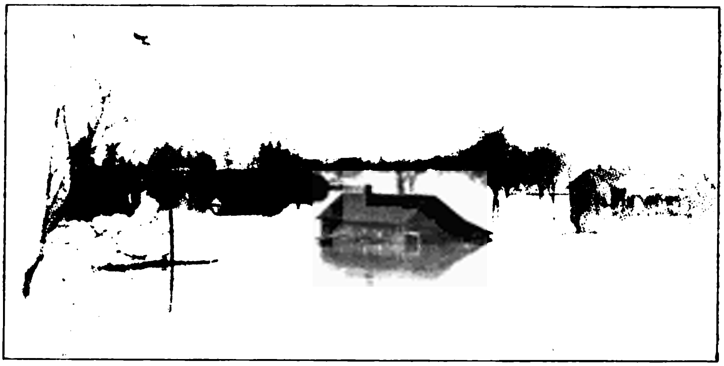
top. The levees were reconstructed and built to the height of eighteen feet, and last year the water came to within five and one half feet of the top. This shows the immediate need of some other method of protection besides levees. The causes for this rising of the flood heights are many, some of which are: the clearing of forests, natural tendency of the river bed to rise slowly, the cramping of the capacity of the river by the building of levees. These conditions will not be changed in the future, so it is evident that some other method of flood prevention must be resorted to.

FLOOD DEVASTATION AT HICKMAN.

*Courtesy Current Literature.*

In order to overcome these floods which lay waste such an enormous amount of territory, almost thirty thousand square miles, various plans have been presented. The various plans are: the rebuilding of levees, giving the river an entirely new course free from bends, construction of numerous artificial outlet channels leading directly to the Gulf, and building a series of reservoirs at the headwaters of the chief tributaries. Probably any of these, with the exception of the first, which would only be effective for a short while, would prove successful; but which one would be the most practical and economical? Engineers differ in opinion upon this subject, but the greater number concede that the last one mentioned, the reservoir system, would in the end prove most successful.

The levee method of stopping the floods is about the most economical, but at its best it is a makeshift. It has answered its purpose only fairly well up to the present time, and it must be remembered that each year the water is rising higher than the previous year. In time, if we continue to use the levees for protection, we will be able to apply the term skyscraper to them. Another objection is the devastating war which the muskrats, crayfish, kingfishers, and innumerable insects and reptiles wage against them. Besides these, the wave-wash, rains, and drifts have an erosive effect on the levees. Engineers have developed a plan, building the levees from reinforced concrete, which would



CAUSED BY A LEVEE BREAKING.

*Courtesy Current Literature.*

overcome the destructive effect of these pests, but would not add to their success as protection from the rising high water mark.

The plan to give the river an entirely new course free from bends is without doubt a good one, for it has been successful in the case of the Seine, Elbe, Main, and parts of the Ohio. If the Mississippi were properly drained by straightening, in order to give its own waters, and those which it must take care of, an unobstructed flow, it would afford a much greater outlet to the Gulf. The dredging machinery which would be necessary has already been purchased by the Government and is being used at Panama. This item would greatly reduce the cost of the method, but even

with this reduction the cost would be enormous. The high cost of this method is its most noxious feature.

The construction of artificial outlet channels leading directly to the Gulf, if sufficient in number, would relieve the strain. However, by this method a large tract of arable land would be destroyed and again its success is doubtful.

Building a series of reservoirs at the headwaters of the chief tributaries would be the least expensive, with the exception of the levee system, and in the end prove the most successful. A number of reservoirs, established at points where the accumulation of water could be controlled, would enable the excess of

MEMPHIS DURING THE FLOOD.

*Courtesy Current Literature.*

water to be held back, and produce a slight change during the season of maximum flow. This water thus stored would be available for regulated power development, and help to maintain the desired flow when otherwise low water would prevail. This headwater system would inevitably lower the crests of the floods and prevent a combination of crests reaching Cairo at the same time. Experience shows the success of this method. A system of artificial reservoirs, with a capacity of thirty-five billion cubic feet, at the source of the Volga and Wista Rivers in Russia has been notably successful in the prevention of floods.

At Panama, the United States Government has in its possession a complete organization, administration, and engineering equipment for such a plan, which are now being used in the construction of artificial lakes at Gatun. Instead of disposing of this equipment as soon as it is of no more use at Gatun, the rational thing to do would be to bring it to the Mississippi Valley and utilize it in the construction of reservoirs. By using this equipment there would be an enormous reduction in the cost. This method, economized by this equipment, seems the most reasonable and applicable means of protecting ourselves against the floods of the Mississippi.

It is surprising to think that our Federal Government remains inactive when it should take to its care and expense the task of evolving a satisfactory and permanent method of protection and carrying it out. The unsuccessful levees are, at present, the only existing means of protection. There is no work more urgent or of greater magnitude which should be looked into by our Government, not even the Panama Canal, than the successful mastering of these destructive floods. The expense of this task is by far too great to be paid by the States immediately bordering upon the Mississippi; nor should they be expected to bear the brunt of the waters loosened from Pennsylvania or the Dakotas. It is most certainly a Federal charge, and it is only our Government that would be able to obtain the sums needed for such a great undertaking.

# THE MAXIM SILENCER—ITS PRACTIBILITY

*W. Seymour.*

IN the middle ages when troops wore armored mail for protection from their enemies, men's thoughts were directed in making this as perfect as possible. With the advent of gunpowder, all this changed. Armor was now an unnecessary encumbrance, and a new field for the protection of the warrior was opened, the new idea being to make the trooper as inconspicuous as possible. At first, little attention was paid to this feature, and the armies of Napoleon's time wore glaring uniforms which made them stand out, presenting a very prominent mark for the shooter. Modern science has changed all this until now it is the aim of the war departments to make the troops as inconspicuous as possible. Anything that could be done in this line was eagerly adopted. The uniforms were changed to a color which harmonized with the natural surroundings, thus affording a means of protection such as is given by nature to wild animals. Another improvement that is the result of very modern science, is the development of smokeless powder. The use of this permits the shooter to see what he has been shooting at, and does not envelope him in a dense cloud of smoke that formerly made this impossible. Often the enemy's best mark to fire at was this cloud of smoke; but now all this has been done away with.

But still another means of detection was left; namely, the report made by firing. How to get rid of this was a question that puzzled military men and inventors. They tried to make a powder that would explode without noise. This failed, and no solution of the problem seemed in sight when Maxim, the inventor of many other things, conceived the idea of muffling the report by means of a chamber which would let the powder gases out slowly, thus doing away with the report, as it was supposed to be the disruption of the atmosphere that caused the report. After experimenting for some time, he devised a cylindrical chamber, varying in length from four to eight inches, which contained a series of funnel shaped chambers. He fastened this

to the muzzle of the weapon with a thread. It was the inventor's intention to give by means of this chamber a whirling motion to the gases as they left the gun. By letting the gases out slowly he knew that the report of the explosion would be silenced.

Everything looked promising and the advanced reports indicated that the coming invention would revolutionize the world. Maxim got the Colt people to manufacture his patent for him, and proceeded to advertise his invention.

Contrary to expectations, however, the silencer, when tried with a high powered rifle, did not make the gun noiseless. What was the matter? The theory seemed faultless, yet the desired result was lacking. Evidently something had not been taken into account. When it was tried on small caliber arms it gave fine results, all report being obliviated. For example, one could shoot a 22-caliber rifle in a room without waking a friend in the next room. Investigations proved that probably the noises caused by the gases disrupting the atmosphere had been successfully silenced, but that now the bullet was causing the trouble. In all firearms, where the velocity of the bullet is over twelve hundred feet per second, the projectile causes a vacuum to be left behind it. The cause is that the velocity is so great that the air cannot rush in immediately behind the bullet, thus causing for the slightest fraction of a second a vacuum. When the air rushes in to fill this, it does so with such great force as to set the medium in vibration, which is responsible for the report that reaches the ear, always provided the report due to the explosion has been muffled. The reason that the smaller guns were successfully silenced was because the velocities of their bullets were less than twelve hundred feet per second. The writer has tried both the 22 and the army gun, and found the 22 to be silent, although the service rifle was far from being so.

Thus it seems that no gun developing over this velocity can ever be made entirely silenced. It may be asked; "Why use guns with a high velocity; or why not use guns with heavy bullets and low velocities, and thus enjoy the advantages of noiseless shooting?"

From a military standpoint, high velocity is one of the prime requisites in modern warfare, and every year sees new guns

brought out with increased velocities, flatter trajectories, and thus a longer killing range. The low velocity type is practically worthless at any considerable range, or in war at any range except in a hand to hand fight. High velocity, even with a report, is imperative, as it gives increased accuracy, flatter trajectory, increased killing power, and greater penetration.

As far as military use is concerned in actual warfare, the silencer is a failure, and it seems to have been proved beyond any doubt that there never can be invented any means of successfully silencing the report of high power firearms. The idea of protecting troops by the use of noiseless guns is a dream of the past. The hunter that hoped to be able to shoot several consecutive shots at his quarry without the latter being alarmed, was doomed to disappointment.

However, his invention is far from being useless. In breaking in troops to use the service rifle, a great deal of difficulty has been found in keeping them from flinching when the gun is fired. The recoil and the whip of the barrel was largely the cause of this trouble. The silencer has proved to be a great aid in helping the raw troops to learn to shoot without flinching, as it reduced the recoil from fifty to sixty per cent (exact figures unobtainable). Also the additional weight of the silencer at the end of the muzzle has a tendency to prevent the whip of the barrel. For these reasons, both the various State Governments as well as the National Government have bought many thousands of them.

Thus, although the intended use of the silencer did not prove to be practical in actual warfare, its use is very helpful in training men. It is also used to a considerable extent in target shooting.

# THE SUPERIORITY OF HEAVY SHIPS

*W. C. Schmidt.*

IN a warship there are three chief elements which determine her value in battle. These are, namely, speed, defensive armor, and the number and size of guns. In all of these points a large ship is superior to a small one.

As the size of battleships has increased, the ships have been made relatively longer. This means that their lines can be made finer and therefore can have greater speed for the same horsepower per ton than a smaller and less finely modeled ship. That is, if the same proportion of space and weight be given to the boilers and engines, the larger ships will be faster.

The larger ship also has the same sort of advantage in armor. A ship of twice the tonnage of another can have much more than the same comparative area armored. For example, the United States dreadnought, *Delaware,* has heavy armor seven feet above the water line, while the *Kentucky,* which displaces only one-half as much, has armor which extends only three feet above the line.

The most important element of a fighting ship is, however, her gun power. Neither speed nor armor can make up for the lack of a heavy battery, although a heavy armament may, in a way, take the place of the other two elements. It is in their battery power, especially, that the large ships excel a much greater number of small vessels.

At the present time, the twelve-inch guns are regarded as the only ones which would be effective against battleships at the modern battle ranges of four or five miles. If a number of heavy guns are to be mounted on a ship, they must be far enough apart so that they will not interfere with one another. This fact was learned when the *Oregon* class of ships was built. In this class of ships, the eight inch guns were built to fire across the tops of the twelve inch turrets. This was all right theoretically, but practically, when the eight-inch guns were fired, the concussion was so great that it knocked down the men in the large turret.

If this is the case, why not mount two sets of four eight-inch guns on two separate ships? The difficulty in such an arrangement would be that more strength is lost than gained.

This disadvantage of making the above change would be that there would be an increased length in the line of battle. Suppose, for example, that four heavy ships should engage ten ships like our *Connecticut.* The fleets would probably fight in a single line. Since the dreadnoughts could leave just as short intervals between them as the smaller ships, their line of battle would be only as long as that covered by four of the enemies' ships. That is, they would have the fire of forty guns against the sixteen or twenty guns of the *Connecticut.* This would mean that the dreadnoughts could sink the first four ships of the enemy with their tremendously superior fire without making it possible for the rest of the fleet of small vessels to reach them. Then the next four of the smaller ships could be sunk in a similar manner.

Hence, it is to be seen that the large battleships have the advantage over the smaller ones because of their superior speed, greater armor protection, and the fact that in fleets the heavy ships have a shorter line of battle and can therefore concentrate more heavy guns in a given distance.

# THE USE OF "GRAPHS" AS FACTORY REGARDS

*F. W. Schmidt.*

THE object of this article is to show how one manufacturing plant uses graphical charts to record the production, sales, and costs of the business; how it tabulates this data in its "curve room", and also to show in what way such methods can be used to advantage in other plants.

The plant under consideration is situated in a small New Hampshire town, employs about seventy-five people, operates a factory of moderate size and equipment, and, in its external appearance, does not differ from the thousands of small factories that are scattered throughout the country. Yet it maintains a department that might be considered in a measure as a complement to the "planning room," which is such an important factor in the Taylor system of shop management, and to it is credited a large part of the unusual efficiency that makes the factory conspicuous. For lack of a more suitable name, this department is known as the "curve room."

The function of the curve room is to keep a graphic record of the activities of every part of the business. This is done by means of charts, which range from forms of ordinary size, such as may be kept in correspondence files, to "graphs" the size of large wall maps, which are mounted on frames. Upon these graphs are kept annual, semi-annual, quarterly, monthly, weekly, daily, and even hourly reports of the progress made by the departments, their costs, their output, their overhead charges, and the many detailed statistics that are needed to keep the executive heads of the plant in constant and accurate touch with each item of expense, sales and production. The information thus tabulated enables the management to establish standards, by which the work of the factory is maintained, and to make provision for increases or decreases in the volume turned out, by observing the "tendencies" as they are pictured on the various charts.

Over three hundred different records are kept by this map form. The actual figures that serve as the base for these graphs

are kept in files in the usual maner. While it is not probable that such an extensive use of the graphs would be practical for every business, it is obvious that such a system for the presenting of records is of great value because of the opportunities for comparison with the corresponding periods of former years, months, or other units that it makes possible. It has been found especially useful to manufacturing firms, whose fluctuations in sales, labor, material, profits, and the countless items of cost, are so marked in most cases, as to make some such comparative reports neces-

THE CURVE ROOM.

*Courtesy System, the Magazine of Business.*

sary. It is the purpose of those graphs to "visualize" these comparisons; to indicate by means of colored lines the risings and fallings of costs, production and other items of information, instead of by parallel columns of figures. The scheme is adaptable to so many kinds of business that a mere outline of it will suggest numerous methods of applying it.

In this particular factory, the exact figures required for use on the various charts are gathered daily by a clerk who is one of the staff of three employed in the curve room. These figures are then

"plotted in" on the charts. To insure accuracy, one draftsman calls off the figures to the other, who plots them with pencil; then they change places and go over the work again, thus checking each point. Twice a day the chief of the curve room goes over these charts and draws, in colored ink, the various lines that represent the figures that are required for record.

One of the most important features of this tabulating work, however, is the task of figuring out and charting the "average", and the "standard" lines, both of which are extensively used to serve as the basis of comparison. On one of the cost maps for example, actual cost of items named in a space on the left, is indicated by heavy broken lines as the figures come in from day to day. Light dotted lines which indicate the monthly "average" of cost are drawn on the same sheet as the daily cost. These "average" cost lines are figured every day, in order to show clearly at any time the actual costs on any day as compared to the average for the month up to that point. These statistics are given still greater value by indicating, by means of straight blue lines, the "standard" costs. Thus the "actual", "average", and "standard" costs of each item of the business are shown in map form in such a concise and condensed way that any variation is immediately apparent. When the work of every department is similarly reduced to graphic form, it is a simple task for the management to keep in accurate touch with the progress of the plant by a daily visit to the curve room.

Most of the charts are eight feet in length by about two feet in height,—a size sufficient to contain a continuous daily curve for one year. They are mounted in wooden frames such as are used in architects' and contractors' offices and are hung from the ceiling.

Such a system for tabulating records, as is used by this plant, is of especial value to the management in establishing standards of work and cost, and in providing for recurrent fluctuations of the markets. For instance, a demand for the plant's produce may vary with the different seasons of the year,—a condition that would, of course, be apparent on the graph.

From the records of past years, the management is enabled to determine the "quota" for each period and to express this standard on the graph by means of a straight blue line extending

through the period in question. In the same way, it is possible to reduce the various costs of production to standard limits and thus to check any undue excesses before they assume dangerous proportions. It has been through these advantages that the factory in New Hampshire has eliminated much of the extravagancies and wastes that mar the efficiency of so many small plants, but which are usually uncorrected merely through ignorance that any leaks exist. It is obvious that the use of such graphs may be valuable in warning the management of exceptional conditions in his plant and in enabling him to provide for the future conditions that, judging from the records of the past, may be reasonably expected.

# THE TECHNICAL TRAINING OF SALESMEN

*C. W. Smith.*

IT was first recognized by the Carnegie Steel Company, that salesmen who possess a knowledge of the processes in the manufacture of the various products that they sell, are more valuable than those who do not possess that knowledge. In the past, when a salesman showed a desire to broaden his idea of the articles with which he dealt, he was permitted to go at will about the plants manufacturing those particular articles, and through its various parts as he chose, picking up what little knowledge he could here and there. This practice proved so unsatisfactory that in the Carnegie Company, a school for salesmen was founded.

The school was designed to show the salesmen how iron, steel, and their products are made, to familiarize them with the materials they sell, to show them how their products excel those of their competitors, and to furnish them with convincing arguments on that subject. Practically all the men are without technical training, so that the course is made as simple as possible, giving the theoretical side of the various processes in the plainest language, so as to insure complete understanding. The course is made up of the study of: first, raw materials; second, the furnaces,—their construction and operation; third, the rolling mill processes; fourth, laboratory work; and fifth, discussions, examinations, and standings.

In the study of raw materials, the student gets a general knowiedge of the foundation of the industry, the Lake Superior iron ores, giving grades, ranges, and particular attention to the Mesaba field, from where the greater part of the material is obtained. The different types of mining are shown and the differences between ores are all made clear. The difficulties of obtaining ore of constant composition and the necessity for uniformity of it for successful operation are also explained, and, finally, the transportation of materials to their respective destinations brings the class to the second division of the course.

After following the materials, one day is spent in studying the processes of making coke, and another in the by-product plant. The furnaces are then taken up and studied by both lectures and text books, alternating with the practical operation. Special notice is given to the reduction of the ores, as to how the slag is tapped off, and how the gases are cleaned and dried and then used for boilers, stoves, or internal combustion motors. Next, the conversion of iron into steel by removing undesirable elements, is taken up, and then the two methods of making steel are explained,—the Bessemer and the open-hearth,—but these, too, are studied by alternating the readings and inspections, for it has been shown that a marked advantage is gained by not tiring the men mentally. The advantages of steel made in the first way are shown, together with the adaption of each for its own purpose.

The rolling mill is next studied, and a great deal of time is spent there learning heating, types of engines, and the style of mill, and special attention is given to the finished material. After the student has become familiar with the rolling mill, chemical and physical testing is taken up, though it should come before the rolling. Part of this time is spent in watching the chemical tests to learn how the raw materials are examined before being used, and to emphasize the care that is used in keeping everything up to standard. The rest of the time is spent in following the physical tests, such as hot and cold bending, and measuring and recording the stress when pulling, by accurate calculations of a slide rule. It is here that the most common faults are shown, and the explanatory talks are given.

Upon finishing at the laboratories, the work of the office is carefully studied to impress the students how necessary it is to both the office and the mills that their orders should be clear, concise, and correct. During all this time the students have been taking notes so that, when the course is finished, each man is able to write a long and complete description of each process that he has seen. His paper is then corrected and put into book form so that when he leaves the school, each man will have about two hundred pages of very valuable notes, maps, and tables.

Before leaving, however, an examination lasting five days is given. This examination serves two purposes;—that of keeping the men attentive during the inspection and also if any bad points are found in the plant, they are discussed and corrected, benefitting the manufacturer. Each examination is given a mark on its merits, upon which the salaries of the students often depend.

The first year saw twenty-five men taking the course, with a long waiting list of men ready to take advantage of any vacancy as soon as it should be reported. Those twenty-five have proved so conclusively the advantages of the system, that from now on the course is an established thing. It is also believed that all large companies will soon follow in the path made by the Carnegie Company.

# CONCRETE

*Brice Bowman.*

CONCRETE may be defined as an artificial stone. In its simplest form it is any mixture of lime or cement, sand, and water, with broken stones or bricks, bits of slag, gravel or other hard material. The hard, coarse material is termed the aggregate, and the mortar in which it is imbedded is called the matrix.

Béton, or concrete made with hydraulic lime or cement, was employed in ancient times in some of the most renowned works of history. The artificial stones used by the Babylonians, Egyptians, and Phœnicians, as well as by the Greeks and Romans, were all species of béton, or what is now called concrete. The Romans used it in large quantities in the construction of harbors and piers in the Mediterranean, and for aqueducts and roads, many portions of which exist today.

In explaining the masonry construction of the middle ages, we find little difference between the coarse mortar used and the concrete as it is made to-day. The mortar used in the masonry of castles and churches erected during that period is, in fact, a concrete with small pebbles instead of the larger ones used in the modern product.

From this it is evident that concrete is not a modern invention, but rather a refining of materials and perfecting of methods; an evolution of old ideas rather than a new discovery.

It is true, however, that only within the past few years has the use of concrete become general, and its adaptability to all kinds of engineering construction been thoroughly tested.

In making concrete to-day, the proper proportion of cement, sand, and aggregate is considered to be attained when the cement paste exactly fills the voids in the sand, and the matrix exactly fills the voids in the aggregate. Less than enough mortar to fill the voids in the aggregate results in a weaker and more porous concrete, and more than enough adds to the cost of the concrete without increasing its strength. A fair range of proportions for

most engineering work is cement, one part; sand, one to three parts; aggregate, three to six parts.

To obtain the best results, the mixing of concrete should be exceedingly thorough. This is done by hand, with shovels on a wooden platform, or by mechanical means. There are two classes of mechanical mixers, intermittent and continuous. The most common form of intermittent mixer is a cubical iron box hung on trunnions at diagonally opposite corners. The cement, sand, and

MONOLITHIC CONCRETE STATION.

*Courtesy Universal Portland Cement Company.*

aggregate, in the proper proportions, are placed in the box through a suitable door in one side, which can be closed and fastened; the water is admitted through the hollow trunnions, and the box is put in revolution by an engine or other motive power. After from ten to twenty turns, the box is brought to rest, and its contents of thoroughly mixed concrete dumped out and a new charge of cement, sand, and aggregate introduced for mixing. A common form of continuous mixer consists of a trough or cylinder in which a spiral or bladed screw shaft revolves; the raw mate-

rials are introduced continuously at one end, and a continuous discharge of mixed concrete takes place at the other end.

It is evident, of course, that the cement enters into chemical combination with the water used in the mixing and acts as a binder, tenaciously holding the whole mass together. As soon as the cement is mixed with water this chemical change commences, or the concrete begins to "set" as it is generally expressed. For this reason, the concrete must be put in place immediately after

A CONCRETE BRIDGE.

*Courtesy Universal Portland Cement Company.*

mixing. At the end of about three or four days, the concrete is solid enough for the supporting forms to be removed and after thirty days it is ready for the loads for which it is designed. The hardening continues for months, the concrete becoming stronger as time elapses.

With the discovery and application of methods of making Portland cement (1820-50), concrete assumed its place as one of the principal materials of engineering and each year has shown an increasing demand for concrete construction and a constantly widening field of application.

The plasticity of concrete is a most valuable quality and one which is largely made use of in practice. Aside from simply being deposited for foundations, abutments, and the like, it is molded into shapes as intricate as may be desired.

Another highly important advantage resulting from the plasticity of newly mixed concrete is that other materials, such as iron, may be imbedded in it.

Concrete alone will withstand enormous compression strains but when heavy strains other than those of compression are to be

CONCRETE RESIDENCE.

*Courtesy Universal Portland Cement Company.*

provided for, the concrete is so strengthened with steel that the metal takes the tensile and sheering strains. This construction, known as reinforced concrete, is rendered feasible by the facts that concrete has considerable adhesion for iron and steel, and that the coefficients of expansion (by heat) of the two materials are practically the same.

Concrete, reinforced with steel, has been successfully used in office buildings, apartment houses, theatres, schools, courthouses,

public libraries, mills, factories, warehouses, foundries, grain elevators, stand-pipes, bridges, culverts, abutments, sea-walls, breakwaters, jetties, piers, reservoirs, dams, aqueducts, sewers, subways, chimneys, et cetera; in fact by various methods of reinforcing, it can be put to almost any use as a building material.

The use which engineers are making of concrete in all lines of construction proves conclusively that they believe it equal in strength and durability to stone masonry. Many of the most important railroads of the country are using it exclusively for bridges, culverts, abutments, and so forth. They have found that in bridge construction it costs less than structural steel, it is more enduring and is decidedly more pleasing to the eye. The Government too, realizes the value of concrete construction and is using it almost entirely in its fortifications and coast defences.

Buildings sixteen stories high, made entirely of reinforced concrete, (not the usual steel skeleton type) are entirely feasible and have proven themselves much stronger than any other type of constructions. They are fire proof, sanitary, beautiful, and durable. In fact, superior durability is one of the best-substantial claims for concrete buildings. It has been recognized that concrete becomes stronger with age, and the same is not true of any other material.

Concrete pavement has also emerged from the experimental stage and at the present time a properly constructed concrete pavement comes very near to meeting the requirements of the ideal pavement. It costs much less than either brick or granite block paving and in wearing qualities will outlast the former.

It might be expected that a material with so many desirable qualities would be more expensive than the other materials which it is displacing. The contrary, however, is the case. In building construction, concrete is cheaper than stone, or steel frame and terra-cotta. In bridge construction, it is cheaper and more durable than steel. It can be manipulated by unskilled labor to a greater extent than any other material. The fact is that ingredients necessary for making concrete can be laid at almost any point in the country cheaper than any other building material and the cost of putting it in place is less.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## KEROSENE FOR AUTOMOBILES

*E. Carlisle Hunter.*

FOR many years, tests of different kinds have been made in the hope that kerosene might be substituted for the more expensive gasoline as fuel for automobile engines. For the most part, these tests have been unsuccessful and but recently has apparatus been devised to make the substitution.

The engine on which the experiments were made in the mechanical engineering laboratory of the University of Michigan was an Olds automobile engine of the early, horizontal, single cylinder type. With its 5-inch bore, and its 6-inch stroke, it was rated at 6.5 horse power. A Blom carburetor was used in which the exhaust gases of the engine were used to heat the mixture.

In other tests, in starting recourse was had to a gasoline carburetor placed in the inlet pipe. It was found that the engine, when cold, had to be started on gasoline until the Blom carburetor was warmed up. This generally took about two minutes.

The kerosene used was furnished by the Standard Oil Company at a cost of seven cents per gallon in marked contrast to the twenty cents paid for gasoline. A jump-spark ignition system was used, the spark being advanced as far as possible without the engine knocking. The output of the motor was measured on a brake-test device, considered as standard.

The results of the tests with kerosene are given in Table 1. The economy of the first two runs was not the best, due, perhaps, to the lack of familiarity with the apparatus. In the fourth run, however, a full consumption of only 0.77 lbs. of fuel per brake horse power was obtained, which compares favorably with the average consumption of gasoline in the other tests. It was, how-

ever, found impossible to develop the rated horse-power of the engine when the Blom carburetor was used, 5.12 H. P. being the maximum developed with kerosene. The passage from the carburetor was very narrow, and probably reduced the power considerably. With a more direct passage of the carburetor to the engine, the horse-power would probably have been increased.

In Table 2, we have the results of several tests made with the same engine using gasoline for fuel. All of these were made under normal conditions, as the cost of gasoline was calculated on a basis of 11 cents per gallon.

These tests were not intended to show the maximum horse-power which could be obtained, but rather to demonstrate, by comparison, the economy of the two fuels. The disparity in power obtained with kerosene could probably be made up by using a larger carburetor.

TABLE 1. TESTS WITH KEROSENE.

| No. | Duration, minutes. | R. P. M. | Brake Horse Power. | Fuel per B. H. P. hr., lbs. | Fuel cost per B. H. P. hr., cents. |
|---|---|---|---|---|---|
| 1 | 90 | 562 | 2.05 | 1.24 | 1.30 |
| 2 | 30 | 600 | 3.10 | 0.86 | 0.90 |
| 3 | 90 | 630 | 3.39 | 0.80 | 0.84 |
| 4 | 80 | 742 | 5.12 | 0.77 | 0.81 |

TABLE 2. TESTS WITH GASOLINE.

| No. | Duration, minutes. | R. P. M. | Brake Horse Power. | Fuel per B. H. P. hr., lbs. | Fuel cost per B. H. P. hr., cents. |
|---|---|---|---|---|---|
| 5 | 30 | 610 | 3.30 | 1.18 | 2.26 |
| 6 | 30 | 703 | 5.80 | 0.95 | 1.82 |
| 7 | 30 | 794 | 7.80 | 0.89 | 1.70 |
| 8 | 20 | 942 | 9.55 | 1.06 | 2.03 |

# OPEN PIT IRON MINING

*W. F. McLean.*

IN northern Minnesota, where lie the largest iron ore deposits in the world, there may be seen great open pits from which the earth has been stripped, leaving immense bodies of ore uncovered for mining operations. Beside these pits are great mounds of sand, clay, and rock which are rapidly being covered with vegetation so that the topography of the country is being changed by the hand of man from a low plateau to a region of hills and valleys. Pits from which the ore has been removed are filling with water, and future maps of that country will be dotted with locations of lakes a mile or two in length and half a mile to a mile in width. So tremendous is the work going on there now, that a picture of the operations might easily be mistaken for a view of the Culebra Cut in the Panama Canal. In fact, much of the machinery used in stripping the earth from the ore is similar to that used in the excavations in Panama.

The open pits vary in size from small ones of about twenty acres to the larger ones of four hundred acres in extent. On the Mesabi Range, where most of the open pit mines are to be found, the earth covering the ore bodies averages about one hundred feet in depth, and this overburden is removed by steam shovels and carried away by trains of dump cars hauled by dinkey engines. The dippers of the steam shovels have capacities of from two and a half to five cubic yards while the dump cars, the latest types of which are operated by air, hold twelve and sixteen cubic yards. In removing the overburden it is important that the walls of the pit shall not be too steep because of the danger of caving and of the dirt mixing with the ore. The proper grade for the wall is a one to one slope, that is, for every vertical foot there should be allowed one foot horizontally. The earth is dumped as near as possible to the ore body so as to require only a short hauling distance. In general, stripping takes place a year previous to the mining operations, since to begin mining while stripping is still going on would overcrowd the pit.

Where the shape of the ore body permits it and the property owned by the mining company is large enough, the pits are large and circular so as to allow of a spiral track system with an easy grade. A slope of two and a half or three per cent is generally used on the approach to the pit, though the grade is lessened on curves. The cars in which the ore is shipped to the lake ports are run right into the pit, where they are filled by the steam shovels. As soon as a train of three or four cars is loaded, it is hauled to the surface and another train of empties takes its place, while

AN OPEN PIT IRON MINE, SHOWING SPIRAL TRACK SYSTEM FOR REMOVING ORE.

the loaded cars, in numbers of eighty and ninety, make up trains which are sent to Lake Superior to give up their loads to the great freight boats.

There is another method of open pit mining which is too important to be overlooked. This is the milling process. Certain bodies of iron ore are of a soft, easy running variety. It is sometimes profitable to work from underneath such ore bodies so a shaft is sunk at the edge, although the overburden is stripped from the ore surface. From the shaft, tunnels or "drifts" are constructed under the ore, beneath which pockets are built. The ore

is prodded from underneath and from these pockets it runs into chutes which lead it into "tram-cars". The cars are, in turn, run to the shaft where the ore is emptied into buckets, or "skips", by which it is drawn to the surface and dumped into the regular ore cars. This method of mining is only used in comparatively small mines where there is the particular variety of ore necessary.

Although independent mining companies own portions of the rich ore lands of the Lake Superior region, the greater share of the mines are owned and operated by the United States Steel

VIEW OF A MILLING PIT.

Corporation. The district contains countless underground mines in addition to the open pits and the majority of the former are also controlled by the Steel Corporation. This company has built two of its own railroads which yield large profits from their passenger business in the rapidly growing mining country as well as from carrying ore; and large ore carrying fleets have been built to handle the immense tonnage between Lake Superior ports and the harbors of Lake Michigan and Lake Erie. Between thirty and thirty-five million tons of iron ore pass through the Soo Canal annually on the way to the Eastern steel mills.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

*The Teaching of Geometry* by David Eugene Smith, published by Ginn and Company, Boston, 1911.

The first six chapters of this little volume are devoted to a brief sketch of the history of geometry with especial reference to the eminence of Euclid and to the paramount influence of this author upon writers of textbooks. The following chapters contain much material from which selections may be made by the discriminating teacher with a view to making the subject more interesting and concrete. At the same time the author presents in forceful and persuasive language a defence of the attitude of the conservatives toward the modifications urged by a multitude of teachers in the subject matter and method of geometry. In this connection the retention in textbooks is advocated of proofs long known to be false as well as useless.

The book should prove interesting to teachers in sympathy with the modern movement and should furnish arguments to conservative teachers with which to strengthen their position.

PERCEY F. SMITH.

*South American Archaeology*. An introduction to the Archaeology of the South American continent with special reference to the Early History of Peru, by Thomas A. Toyce, N. Y., G. P. Putnam's Son's, 1912. Pp. XV. x 292.

This book is a compilation of materials widely scattered in scientific journals and often inaccessible to the English reader because of having been originally printed in Spanish, Portuguese,

and other foreign languages. The writer has conscientiously tried to neglect no important service of information."

An introduction attempts to consider, with extreme brevity, the nature of the physical environment and of the native tribes, of South America. It is not very thorough or enlightening. Then the several divisions of the treatment are considered, two chapters being devoted to Columbia, one to Ecuador, seven to the Peruvian empire, one to the Southern Andes and the Plains, and one to East and Central South America. The treatment is rather minute for the general reader. Except that a thin stream of historical matter, forming a sort of "setting", ran through the book, it is scarcely more than series of descriptions by paragraphs. An appendix summarizes and points out favorable locations for onbocological investigation, and contains a brief critical bioliography. Good illustrations are included in moderate number, and there are two maps, one a folder of South America.

If one is interested in an amateurish way in American Archaeology, he should profit by this painstaking collection of information. But the book is not of much value to the specialist.

A. G. KELLER.

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'99—Alfred H. Durston is in partnership with his father in the Lefever Arms Company of Syracuse, N. Y.

'99—Eugene B. Reynolds was married, November 26, to Miss Evelyn G. Stoddard at the Madison Avenue Presbyterian Church of New York City.

'05—Charles V. D. Benton has been admitted to partnership in the Stock Exchange Firm of Swartwout & Appenzeller, 44 Pine St., New York City.

'05—Ripley Wilson is in the American Consular service at Almeria, Spain.

'06—Harold C. Strong who was chairman of the Class Day Committee while in Sheff. is now in New York with Lee & Higgins, bonders and bankers. Until recently he has been in Toronto, Canada.

MARCH, 1913

# The Yale Scientific Monthly

VOL. XIX

No. 7

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. MARCH, 1913. No. 7

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. MARCH, 1913. No. 7

## EDITOR'S NOTES.

### MINOR MANAGERSHIPS

THE recent action taken by the Minor Athletic Association in regard to the minor managerships is another step in cleaning up one of the evils which has long handicapped our minor teams. It has not only done away with crude politics, but it has also given Sheff a fair representation in these managerships.

At last Sheff is on an equal footing with Academic in every branch of athletics. Now let us show the College and the University that these trusts, no matter how large or how small, shall be carefully guarded and shall receive good and efficient care at the hands of Sheff.

* *

### THE ACADEMIC SENIOR COUNCIL

WE are in hearty accord with the sentiment expressed in the editorial and in various communications which have recently appeared in the *News* concerning the action taken by the

Academic Senior Council in regard to the minor managerships. It is scarcely conceivable that seven intelligent and representative men could so distort their point-of-view as to believe it to be within their power to delve into an affair which is solely the business of the Minor Athletic Committee. The indignation of the latter was certainly justifiable.

The only reason which we can see for this arrogant action by the Council is, we regret to say, not only to test its power, but to build up the prestige of the Council, so that its influence, instead of being practically nil, will grow and become an important factor in the College like the Sheff Senior Council is in Sheff. We commend the desire to build up the influence of the Academic Council. There is a big work for an efficient body of this kind in Academic, just as there is a big work for the Sheff Senior Council. But we must condemn the method by which the Council has attempted to inform the University of the existence of a Senior Council in Academic.

In our opinion, the Academic Council cannot hope to attain the position and influence which the Sheff Council enjoys with its present make-up. In the first place, the College Council is not representative enough. It is practically impossible for seven men to justly represent such a large and varied number of organizations which exist in Academic. In the second place, the Council does not meet regularly so that it, as a body, can keep in touch with the events and welfare of the College.

We would suggest to Academic, not in egotism, but with sincerity and with an interest in its welfare, that it adopt a plan of electing and running its Council similar to the method in Sheff. We offer this advice in the best of spirit and with the knowledge and experience which we have obtained from the workings of our own Council. The many big and important changes which the Sheff Senior Council has brought about, and the large influence which it yields for the betterment of Sheff, leads us to believe that our Council approaches very near to the ideal.

For the benefit of those who are not familiar with the composition and workings of our Council, we give here a brief description of it. The Council is composed of sixteen men, eight society

men (one elected from each house), the President of Byers Hall, and seven neutrals or non-society men. Each house elects one of its most prominent men to represent the members of that house. The non-society men elect seven of their most prominent and energetic men. By prominent, we do not mean big athletes. We mean men who are recognized leaders of ability and who have the welfare of the school most at heart. In this group every phrase of undergraduate activities is represented. The Council is a group of broad-minded, energetic men who are well up on all the undergraduate activities. Meetings of the Council are held every Monday night in Byers Hall at seven o'clock. All absentees from any of these meetings are fined $1.00 The meetings last, on an average, one hour. In this way, every member hears opinions on all types of undergraduate activities once a week. Small committees are appointed to investigate and to get the sentiment of the class on any subject that comes up in the meetings.

Although Sheff has always followed Academic's lead in University affairs, we strongly believe that in regard to the Senior Council, in order to have a strong, efficient and influential one, it would be well for Academic to follow the lead of Sheff.

* *

## THE KIND OF ADVERTISING THAT DOESN'T PAY

THERE are many people who have the idea that college is made up of a choice collection of the sons of rich men. We, however, know that this is not the case, but that it is made up of a goodly number of earnest, hardworking fellows, many of whom are paying their own way. It is not necessary for us to quote statistics on this point. You meet these men in the class-room, on the athletic field, everywhere;— and you appreciate them because you yourself are in earnest. Unfortunately this side of college life gets very little attention from the daily papers,—it is too dull and somber to make good reading matter for the public. But, if now and then some foolish escapade, in which a few non-

representative college men are implicated, can be gotten hold of or some social function connected with the college can be reported, it is printed in the most gorgeous colors and handed out to the public in full-column, front-page style.

It will be necessary for us to recall only one or two incidents to make you see clearly what we mean. All of us who were in college last year remember the usual, and somewhat time honored, custom of the Freshmen in their arsonous attempt on the old wooden bridge on Hillhouse Avenue. To us ,who knew and understood the circumstances, it did not seem like a great misdeed. The bridge was an ungainly thing on one of New Haven's most beautiful streets; and besides, the damage done was comparatively slight. We were inclined to smile at the custom and hope that the railroad company would finally take the hint and put up a finer and more substantial structure. The faculty, however, looked at the question from more than one side and resolved to put a stop to it. Again, on the night of the Princeton game, you may recall the riot which took place at the Hyperion Theater for which college men may or may not have been responsible. Both of these incidents, almost as soon as they had occurred, were flashed from one end of the country to the other; and with the usual amount of distortion and exaggeration that an up-to-date journalist can give such material.

It is not at all surprising, then, that through advertisement of this kind, serious minded people learn to look with suspicion on the college and its activities. Such notoriety can give rise only to adverse criticism. It is up to college men, therefore, not only in regard to their conduct en masse, but individually as well, to guard against this sort of publicity, and to use every opportunity, on the other hand, to create different ideas in the public's mind.

* *

## TRADITION

TRADITION is a quantity that has always been inherent in Yale of the past. Yale without tradition would be like a New York without its Broadway. Furthermore, we are losing,

without doubt, some of our traditional customs, little by little, while no steps are being taken to replete the loss. That this is true is at once evident when one stops to consider that each year the Freshman know less about the good old customs that have been associated with the place for so long, and, moreover, they are becoming more and more lax in their adherence to them. Just the other day a Freshman was heard to make the remark that he did not know that pipe smoking on the street was forbidden. Why should he know, when the only readily available source of information on this subject is the little Y. M. C. A. blue book? Repeaters, who are not going to graduate with their class, wearing moustaches, Freshmen smoking their pipes on the street, even at this time of year, and the discontinuance of the rush on Washington's Birthday, although far be it from us to discuss further that already much mooted question, all tend to reveal the truth that time honored tradition is on the wane. Why not start a new custom to grow up with the future classes? There are several things that might answer for this purpose. Suppose we let it be understood that in the future all Freshmen are to keep away from the Grill Room in the Taft. Their company can well be dispensed with here, and since Mory's has become a club, another cafe with full freedom of admittance should be reserved for the upperclassman. Not only will this favor the upper classman, but it will also tend to prevent the Freshman from getting into the toils of Bacchus.

* *

## THE COMMUTER

BY actual count about one undergraduate out of every six in the Sheffield Scientific School lives in New Haven or in the region immediately surrounding it, and most all of them live at their own homes during the college course. The circumstances in which the commuter is placed are peculiar. It might almost be said that he lives a double life. He partakes of the life of the University to a certain extent, but also has his numer-

ous outside interests and his circle of friends in the city entirely apart from those at college. As a rule these members of the University do not mix with their classmates as much as is to be desired. This is only natural under the circumstances. They find it harder to get acquainted since they do not often come into close contact with their classmates except at recitations, and that is a difficult place to make intimate friends. Having outside interests they do not feel this loss as keenly as they would otherwise, and so drift along, getting about half of what college has to offer them. Often a commuter starts out with the best of intentions, and goes in for some form of extra curriculum activity, but finding it difficult to carry on, and usually meeting with indifferent success, he soon drops out of the contest. He often feels that there is a prejudice against commuters, that nobody expects that he is going to do anything, and therefore he does not try. This attitude is unfortunate and, moreover, is not right. Any man in Yale who does things is recognized and looked up to. It may be a little harder for the commuter to make a place for himself, but it is by no means impossible, as has been shown many times. Every commuter is urged to get as much college life as possible. There are many things he can do that merely require his own volition. For instance, he can make it a point to attend all the smokers and wood-fire talks in Byers Hall. If he lives at a distance this requires something of an effort, but it is well worth while. He can at least go to the ball games and athletic meets of all kinds. He is urged to grasp every opportunity to come around and spend an evening with friends at the college, for in this way he can get much that he would otherwise have missed. Participation in some extra curriculum activity is a fine thing to give him the spirit and enthusiasm which he so often lacks. If the commuters would do their share the rest of the University would be willing to meet them half way, and both would be gainers.

* *

## WHAT IS A COLLEGE EDUCATION WORTH

DOES it pay? This is the question which always comes up when the subject of Higher Education is discussed. Does a man really gain anything in the end by devoting four or five of the best years of his life to getting ready to grapple with life's problems? Quite recently the Seniors have received a request from one of the leading publications of this country for information on this very subject and without a doubt the decision from college men will be unanimously in favor of the College.

If, when we ask whether a college education pays or not, we mean to put a dollar and cents value on education and disregard all other assets, the question becomes one which is hard to answer. As a matter of fact, at the present time statistics seem to show that college men are not such great money getters as they are leaders of men. And that, it seems to us, is the prime object of a college education; not to make men accumulators of wealth, but to make men big enough to overlook the influence of wealth.

The period which produced our great wealth accumulators is quickly becoming ancient history. Where men, a few years ago, were bending every effort to become immensely wealthy, men to-day are bending every effort to bring about a more equal distribution of wealth and justice. One cannot mention such subjects as conservation of natural resources, workingmen's compensation, social and industrial justice, and international peace without connecting with them such names as Gifford Pinchot, Theodore Roosevelt, Woodrow Wilson, William Taft, and many others. These men are all products of college training and they have learned that the power of wealth is not the great power which moves the world, but rather an undercurrent of sympathy and coöperation for and with the great masses which make up the world. They have learned that the things which are worth while are the things which bring the greatest good to the greatest number.

In regard to college life outside of the class-room, let us say that the men meet each other on common ground and learn to estimate each other at true values. In other words, a college man has got to make good not only with the faculty, but with

his classmates as well, irrespective of the size of his bank account. Character counts more than capital. Such conditions, it seems, can only produce results that are worth while.

When asked what his college education was worth to him, a Senior who had earned nearly every cent of his way through college, made the following reply: "I cannot put a money value on the college education that I have had thus far. Even though it should never increase my earning capacity one cent, it would be of inestimable value to me from the fact that it has taught me how to enjoy and get the most out of life. I have an appreciation and understanding of many things that I could have gotten in no other way."

Thus it may be summed up in a few words: Higher education develops the power of discrimination; the power to discriminate between good and bad, and the will-power to choose the good. *Study and education develop power.*

May we not all maintain, then, with Benjamin Franklin, that: "The best investment that a young man can make is to empty his purse into his brain."

* *

## THE REMOVAL OF THE LIBRARY

THE question of moving the University Library has lately aroused considerable discussion. The present building is inadequate to properly shelve all the books in the extensive library of the University, and even though an addition should be built, a similar difficulty would arise within a few years. Obviously, a larger plot of ground is necessary, and Dean Jones has already suggested the lot on University Avenue, across from the Coöp, as particularly desirable. Should the library be moved to this location, there would doubtless be brought about a result long sought after: the more frequent use of this building by Sheff students. At present the library is so far distant from the center of the University, that it is not taken advantage of by Sheff men, and this is a fact to be deplored. But the other day, a Sheff Junior was overheard to say, "At last I have been in the Yale

Library." At first thought it seems as though a college man would be ashamed to make such an admission. He apparently well realized, however, that there are many other Sheff men who have not done as well as he. If we could only appreciate what Academic has long appreciated; the benefit and perhaps even more, the pleasure that could be derived from the freer use of this institution, more of our men would be seen among the book-shelves. If we would only show that we wanted to use the library frequently, it would doubtless be moved to a more central location and prove of real benefit to Sheff men.

* *

## DEBATING

AT this season of the year there is always a little temporary interest in debating. This subject, however, has never called forth the attention and enthusiasm that it deserves, and here in Sheff the interest is especially small. Sheff usually does her share in extra curriculum activities, but in this one field she is almost unrepresented. To be sure, debating is not along the same lines as engineering and chemistry, but nevertheless it offers advantages that are invaluable to anyone, whatever line of work he may pursue. No man will ever regret having acquired the ability to stand upon his feet and express his thoughts logically and coherently. The courses of study in Sheff are highly specialized and anything along different lines has a broadening effect that is of especial advantage. There are plenty of men here who have ability in debating, so let them come out another year and show what they can do.

* *

## ACTIVITIES

YOUR help in college activities and publications is needed. If not in one thing, in another. Just because you have not the physical strength or ability to make a college team, do not

think there is nothing for you to do. There is plenty. Sitting in your room and thinking what you might be doing will never get you there, nor will it get you anywhere. You have got to get out and work, to give up a few hours of your time, which are spent in "chasing around", if you intend to succeed. It will not only help you, but will be a great benefit to others. Perhaps, if you are doing Y. M. C. A., you could help some ignorant man gain an aducation, or some boy whose parents are poor, to enjoy the pleasures which the different clubs offer. There are numerous ways in which you can be useful. There is always plenty for you to do. Just offer yourself and you will be accepted.

* *

## THE ACADEMIC COUNCIL AGAIN

AT a recent meeting of the Academic Senior Council the proposition of excluding the Freshmen when unaccompanied by upper classmen from the Hotel Taft grill room was turned down. Just previous to this the Sheff Senior Council had voted to make it a custom that Freshmen should be excluded from the Taft grill room. Here we have opposite action taken by both Councils on the same question. We strongly back up the stand taken by the Sheff Council. In our opinion, the differences in the two Councils are plainly brought out in this issue. The Sheff Council took into consideration all the facts, and concluded that it would be better for the morals of the Freshmen and of the School if this action went into effect. The editorial in the *News* on this subject presented exactly the view of the Sheff Council, and in our opinion, the view of a great many thoughtful Academic men.

The mere fact that the *News* supports the action of the Sheff Council, and is opposed to the stand taken by the Academic Council in this matter, only goes to prove what we say in another editorial in this issue; namely, that the Academic Senior Council is not a representative body. When the largest and most influential organization, such as the *Yale News,* conflicts with an or-

ganization which ought to be large and influential in the College (the Senior Council) it proves pretty conclusively that there is something the matter with the latter. We believe, as we say in the other editorial, that the fault lies in the make-up and methods of the present Academic Council.

The method which this Council adopted to cope with the situation at the Taft is shown by the following resolutions which it sent to the Dean. This, in our opinion, shows the utter weakness and inefficiency of the Council:

"Vanderbilt Hall, New Haven, Conn., February 11, 1913.

"Owing to the recent disturbances at the Hotel Taft, which have caused so much unfavorable comment, the Senior Council adopts the following resolution, to be sent to the Dean and the Faculty of Yale College.

"*Resolved,* That the Senior Council approves of any action taken by the Dean and the Faculty to insure a discontinuance of such occurrences, and, furthermore

"*Recommends,* That this resolution be forwarded to the Hotel Taft management.

(Signed) "G. B. CORTELYOU, JR., *Chairman.*
"RICHARD W. ROBBINS, *Secretary.*"

This shows that the Academic Council fears to take action in this matter and prefers that the faculty assume all responsibility. The resolution is absurd. What difference does it make whether the Council backs the faculty or not? But it would make a great deal of difference if the Council had backed the stand taken by the Sheff Council. Perhaps the members of the Academic Council feel that they have no right to regulate the morals of the College. The value of any Council is primarily to regulate and influence the morals of the undergraduates. If the Council had interfered more with the morals and less with the athletics of the College it would have, at least, done something. We heartily sympathize with Academic in having such a group of weak and inefficient men trying to run the affairs of the College.

## SENIOR STATISTICS

THE statistics of the Senior Class have been complied, and the names of those men taking first, second, and third places, with the number of votes in their favor, are given below.

Covell leads in the race for class beauty with 24 votes to his credit, Kelleher and Dickinson receiving 22 and 19, respectively.

The best dressed man is Foley, who polled 35 votes. Durand and J. Takamini tie for second place with 22 votes each. Summers follows with 16 votes.

Howe is easily the best athlete with 105 votes. Gore is second with 38, and Riddell third with 30.

Twenty-five men consider Butler the most entertaining, putting Sharpe in second place with 15 votes, and Hathaway in third with 12.

According to 29 men, Sheldon is the most likely to succeed; R. H. Willard, however, is a close second, receiving the votes of 25 men. Reeve takes third place with 21 votes.

The most scholarly man is White, 55 men voting for him. Thirty-four men award this honor to Cæsar, though 18 favor R. H. Willard.

Foss was voted the biggest fusser with 25 votes; Ketcham and Jester follow with 19 and 15 votes, respectively.

Sixty-one votes prove that Chauncey has done most for Yale. Snowdon received 39 votes and C. Martin 19.

Watzek is the most serious minded, according to 31 men. Dows is second with 28 votes, and Wintjen third with 10.

For most popular, Sheldon received 82 votes, Gallauer 25, and Chauncey 22.

The most pessimistic member of the class is Blake, who has 33 votes to his credit; Hathaway is next with 21 votes, and Bugbee follows with 13.

Butler is the most original by 83 votes; Capron received 20 votes for this place, and Booth 9.

The handsomest man in the Senior Class is Denman. Thirty-nine men voted for him, 26 for Snowdon, and 19 for J. H. Stewart.

White is considered the hardest worker by 29 men. Twenty-four men think C. Martin should have this distinction, while 20 would give it to Oviatt.

Butler is by far the wittiest. Forty-six men voted for him. Hulbert was second with 12 votes, and A. V. Hall followed with 11.

The social light of the class is Ketcham, who received 29 votes. Foss follows with 18, and J. H. Stewart is third with 13.

Chauncey has done most for Sheff, 101 men voting for him. C. Martin received 38 votes, Snowdon 18.

Dows is the most religious, leading with 64 votes. Forty-one votes give Aldworth second place; Watzek is third with 34.

J. F. Fisk received 29 votes for the biggest bluffer. E. L. Brown was next with 26 votes, Sykes following with 18.

For the most happy-go-lucky, Butler received 36 votes. Morrill, with 22 votes, and Sharpe, with 13, follow him.

Bowles leads the class in being the most thorough gentleman. Snowdon and English tie for second place with 14 votes, and White is next with 13.

Thirty men give Chauncey the first place as the most versatile; Howe comes second with 23 votes, and Reeve third, with 14.

Sheldon, the best natured man, has 23 votes to his credit. Thirteen men voted for Burnham. Ferguson and Fuller tied for third place with 7 votes each.

R. H. Willard is considered the most brilliant by 39 men. Reeve and Cæsar each have 18 votes for the place, Curtis following with 16.

Sheldon has 39 votes for the most to be admired, Snowdon 27, and Dows 19.

The most sincere is Watzek, with 20 votes. He is followed by Reeve with 18, and Dows with 16 votes.

Martin is the most energetic, 40 men voting for him. Sheldon takes second place with 25 votes, and Chauncey third with 22.

## FRESHMAN HONOR LIST

FIRST DIVISION.

| | |
|---|---|
| Joseph Sorell Alderman, | New Haven, Conn. |
| Russell William Ayres, | Bridgeport, Conn. |
| Julian Braden Baird, | St. Paul, Minn. |
| Frederic Martin Barry, | Auburn, N. Y. |
| Charles Edward Behre, | New York City. |
| Harry William Brink, | New Albany, Pa. |
| Arthur Andrew Burrows, | Chicago, Ill. |
| Leonard Hathaway Caldwell, | Portland, Me. |
| John Livermore Christie, | Montclair, N. J. |
| Benjamin Paxton Collings, | Hot Springs, Ark. |
| Charles Winegar Crispell, | Kingston, N. Y. |
| Robert Sherman Fisher | New Haven, Conn. |
| Leo Gottlieb, | South Norwalk, Conn. |
| Titus Stuart Hale, | Gildersleeve, Conn. |
| Edwin Sydney Hall, | New Haven, Conn. |
| Benjamin Heyman, | Newark, N. J. |
| James Martin Jensen, | Bridgeport, Conn. |
| Archibald Borhek Johnston, | Bethlehem, Pa. |
| DeWitt Tallmage Keach, | Hartford, Conn. |
| John Foster Kendrick, | Chicago, Ill. |
| Charles James Kittredge, | Dalton, Mass. |
| Stewart Arment Koser, | Harrisburg, Pa. |
| Gustav Hermann Lentz, | Catonville, Md. |
| Clifford Shattuck Leonard, | Springfield, Mass. |
| Henry Frederick Leupold, | New Britain, Conn. |
| Daniel Frederick Levy, | New Haven, Conn. |
| Andrew James Lloyd, | Boston, Mass. |
| John Robert McClelland, | New Haven, Conn. |
| Stephen Jones Meeker, Jr., | Orange, N. J. |
| George Ralph Metcalf, Jr., | Erie, Pa. |
| Harry Tomlinson Middlebrook, | West Hartford, Conn. |
| Kai Yan Mok, | Hongkong, China. |
| Norman Boding Pilling, | Waterbury, Conn. |
| Alfred von der Ropp, Jr., | Geneva, Switzerland. |

| | |
|---|---|
| William Thomas Sanders, Jr., | Athens, Ala. |
| Herman Schram, | New York City. |
| Herman Frederick Benjamin Schulze, | Pittsburg, Pa. |
| Leslie Graham Sumner, | Hartford, Conn. |
| Charles Fayette Taylor, | Montclair, N. J. |
| Fred Anderson Taylor, | New Rochelle, N. Y. |
| Clemence Kegelmeyer Werle, | New Haven, Conn. |
| Charles Edward Wiesmann, | New York City. |
| Robert Lockhart Wilbur, | South Bethlehem, Pa. |
| Ernest Krapt Williams, | Mt. Carmel, Conn. |
| Leon Thomas Wilson, | Stroudsburg, Pa. |
| Edwin Eugene Wood, | West Whately, Mass. |
| Konni Zillacus, | Brooklyn, N. Y. |

SECOND DIVISION.

| | |
|---|---|
| Samuel Philip Adams, | Fergus Falls, Minn. |
| William Pope Anderson, 2d, | Cincinnati, O. |
| William Herod Baldwin, | Columbus, O. |
| Chester Raymond Bordeaux, | Seattle, Wash. |
| Donald Ainslie Brewer, | Cortland, N. Y. |
| Malcolm Gallup Brooks, | Chester, Conn. |
| John Robert Bryden, Jr., | Scranton, Pa. |
| William Rudell Clendinning, | New York City. |
| Donald John Cox, | Milford, Conn. |
| Ronald Mayo Crawford, | New Haven, Conn. |
| Maurice Blake Diehl, | Mitchell, South Dakota. |
| Adams Dodson, | Bethlehem, Pa. |
| Franklin Malcolm Doolittle, | New Haven, Conn. |
| Donald Drysdale, | Westfield, Mass. |
| John Montgomery Forster, | St. Davids, Pa. |
| Robert Mervyn Garland, | Pittsburg, Pa. |
| Robbins Newson Griswold, | Wethersfield, Conn. |
| Seth Chandler Handy, | Dorchester, Mass. |
| Arthur Scott Hanford, Jr., | Sioux City, Ia. |
| Theodore Alden Hatch, | New Rochelle, N. Y. |
| David Olyphant Haynes, Jr., | New York City. |
| Morris Hillman, | New Haven, Conn. |

| | |
|---|---|
| Heywood Holden, | New Rochelle, N. Y. |
| Francis Kane Keirnan, | Chicago, Ill. |
| Wallace Bryant Kirke, | St. Paul, Minn. |
| Marvin Lyle Koons, | Penbrook, Pa. |
| Leonard Lane, | Brooklyn, N. Y. |
| Kenric Lessey, | Derby, Conn. |
| Solomon Levenstein, | New Haven, Conn. |
| Edwin Meyer Loeb, | New York City. |
| Robert Jacob Mailhouse, | New Haven, Conn. |
| Leonard Alfred Mannhardt, | New York City. |
| Clarence Augustine Miller, | Franklin, Pa. |
| John Anderson Miller, Jr., | Newark, N. J. |
| Chester Delavan Mills, | New Haven, Conn. |
| Alden Gardiner Newman, | Bridgeport, Conn. |
| Foster Nichols, | Yonkers, N. Y. |
| Edwin Laurence Noble, | Somerville, Mass. |
| Robert Van Arsdale Norris, Jr., | Wilkes-Barre, Pa. |
| Creighton Webb Ryerson, | Jackson, Mich. |
| John Lawrence Schmidt, | Auburn, N. Y. |
| Paul Hart Scott, | Chestnut Hill, Mass. |
| Isadore Selter, | Bridgeport, Conn. |
| Albert Dillon Sturtevant, | Washington, D. C. |
| William Homer Sweeney, | St. Paul, Minn. |
| Paul Edward Tiesing, | New Haven, Conn. |
| Raymond Pardee Tolles, | West Haven, Conn. |
| Charles Alexander Tribbett, | New Haven, Conn. |
| Stanley Francis White, | Shirley, Mass. |
| Myron Converse Wick, Jr. | Youngstown, O. |
| Chester Austin Willets, | Flushing, N. Y. |
| Henry Ward Williams, | Rochester, N. Y. |

# THE COMPENSATED DOLLAR

*Peyton R. Anness.*

THERE is probably no one subject at the present time which causes such vital interest and lively discussion throughout the world as the increasing cost of living. And yet we are seemingly no nearer to a solution of the problem than we were when the subject was first brought up ten years ago. The most practical remedy for the high cost of living is that proposed by Professor Irving Fisher of the Department of Political Economy of Yale University. He proposes to make the gold standard more stable by means of a "compensated dollar."

During the past fifteen years, throughout every country in the world that uses the gold standard, the general level of prices has been steadily rising. Or, as Professor Fisher expresses it, "the purchasing power of gold has been falling". Statistics show that in the United States, during this period of fifteen years, the purchasing power of gold has fallen one-third. In other words the general level of prices has risen fifty per cent. The effect of this is easily seen if we stop to consider a concrete case. If, in 1897, a man deposited one hundred dollars in a savings bank, he quite naturally believes that when he draws it out, it will have increased by the compounding of interest. However when he now draws out his hundred and fifty dollars he finds that he has no more purchasing power than he had in 1897 with his original hundred. In short, the falling purchasing power of gold has cheated him out of his interest.

In fact, all business relations into which the element of time enters, and in which payments are fixed either by contract, usage, or law, are bound to be affected by any sudden great change in the purchasing power of the monetary unit. This change causes an enormous, though unrealized, transfer of wealth from one set of owners to another. Those who suffer from this transfer, although they are quite unconscious of the real cause of their difficulties, naturally complain. The principal sufferers are, of course, creditors, depositors in savings-banks, salaried classes, and wage-earners.

This general condition is well known. The problem is to find and remedy the cause or causes. Many causes are ascribed to this effect. Trusts, trade unions, exhaustion of the soil, cold storage, concentration of population in cities, middlemen, *et cetera*, are all factors which various people claim to be responsible for the high cost of living. According to Professor Fisher, however, these factors, although they may to some degree affect the prices of special articles, cannot account for the general rise in the level of prices. By the general rise of prices is meant the level of *all* prices: retail, wholesale, jobbing, farm, and factory prices. It also means the prices of all articles of trade: land, stocks, bonds, food, clothing, or anything that is bought and sold. The great rise in the cost of living is caused by the rise in this general level of prices, rather than in the rise of retail prices only. This is proved by the fact that, as shown by a study of the actual statistics, the general average rise in the price of food has little more than kept pace with the general average level of all prices. Thus it is clear that, on the whole, the "high cost of living" is due not to a rise in the price of food-stuffs only, but is a part of the great general inflation of all prices, which has been, and still is, going on. The prime factor in causing this rise is the shrinking purchasing power of gold due to overproduction.

Most people, it seems, still cling to the now old fashioned notion that "a dollar is always a dollar", and always stays so. As an actual fact, this is very far from being the case. There are no other units of measure so unstable as the monetary units.

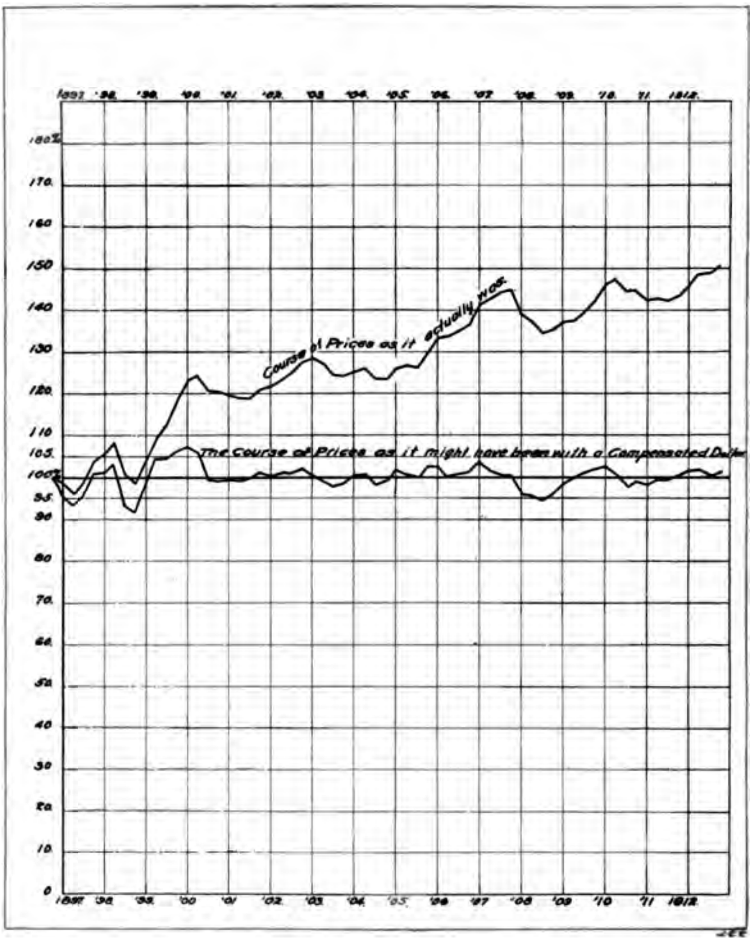
The necessity of a scientific determination of such units of measure as the yard, the pound, the hour, the horse-power, the kilowatt, *et cetera*, is realized by everyone. The different governments of the world have special bureaus to make sure that such units are determined to the greatest possible degree of accuracy, and the standards maintained. Why, then, should we not have a scientifically determined standard in that most important of all measures, the monetary unit? And yet on the contrary, that unit, which is the most essential and the most universally employed by all business men, the yardstick of purchasing power, is allowed to change incessantly. It is at present the only important unit left unstandardized.

The one natural and universal law which fixes the price of everything is that of supply and demand. But people who use that law to explain prices generally forget to include the *supply* and demand of gold. The price of a commodity is its value as measured in terms of money. Now since money is the standard of measure it ought to be fixed, stable and unchanging. But, unfortunately, the gold, which is the basis of all money, is not thus stable. It is in itself a commodity, just as iron or grain is a commodity, and its value, relative to the value of other commodities, varies with its scarcity or abundance. It quite naturally follows the law of supply and demand that when wheat is scarce, its price is high and when it is abundant its price is low. But we must remember that this law holds good just as much for gold as it does for wheat. Our standard of monetary value is a certain fixed weight of gold. Therefore, if the value of gold rises or depreciates, the value of that unit, the dollar, must rise or depreciate. If we were to reckon the price of wheat in terms of tobacco, we would have to take into account not only the value of the wheat but also of the tobacco. And in this respect, when used as a monetary unit, gold is exactly like tobacco.

The problem, therefore, of a scale of prices is not only a problem of the value of the separate commodities, it is a problem of the relation between the value of these commodities and the value of gold.

Many other causes besides the supply and demand of gold affect its general level of prices or the purchasing power. An increase in the quantity of money in circulation and in the velocity of that circulation tends to raise prices. In a like manner, all increase in the volume of trade tends to lower prices. Also it can be proved that a high protective tariff tends to inflate prices by putting more money into circulation and by lessening the volume of trade, to say nothing of the effect of a tariff upon the prices of the protected commodities. Also trusts, labor unions, concentration of population in cities and various other factors influence the general scale of prices. But that these factors are not the prime causes of such inflation can easily be shown. The rise of prices has not been confined to countries with a protective system but has also occurred in such free trade

nations as Great Britain. Also the prices of such commodities as coal, which are admitted into this country free of duty, have risen equally with those paying a high duty. Trusts may have




Comparison between the actual course of prices in the United States and what it might have been if stabilized by an automatically adjusted seigniorage For reasons given in the Memorandum, the stabilization would actually be even more complete than here represented

Courtesy of Prof. Fisher

some effect upon prices, but that the high cost of living cannot be ascribed to them is shown by the fact that such articles as potatoes have suffered a rise in price proportional to that of the trust com-

modities. In short there is but one possible explanation of the great inflation in the general scale of all prices. That is the instability of the value of the gold dollar.

The original use of money was as a medium of exchange. For this, gold did very well for a long time. It has all the qualities necessary for such a medium—concentration of value in small weight, durability, etc. At the present age, however, when business is so largely done by contracts involving a considerable length of time, gold is too unstable a standard. We need a standard of deferred payments, and gold, which is suitable only as a medium of exchange, has been employed as this standard. This much needed standard of deferred payments, together with a scientifically standardized monetary unit, is offered us by Professor Irving Fisher in his "compensated dollar".

Professor Fisher's plan "is to virtually (though not literally) increase the weight of the gold dollar and to vary that weight from time to time so as to maintain a constant purchasing power." He means to substitute a gold standard based upon a fixed purchasing power for the present one, which is based upon a fixed weight of gold. His aim is to compensate for the falling purchasing power of the gold dollar by virtually putting more gold into the dollar. The dollar at present contains 25.8 grains of gold, nine-tenths fine. Now, if the value of gold depreciates, the purchasing power of the dollar also depreciates. To compensate for this depreciation in value, Professor Fisher's plan is virtually to put more gold into the dollar. In other words, as each ounce of gold loses in purchasing power, the loss is to be offset by adding the requisite number of grains of gold to the dollar.

For instance, to-day prices are fifty per cent higher than they were in 1896, which is another way of saying that the purchasing power of gold has depreciated by one-third. The number of grains (25.8 of gold in each dollar) remains the same as it did in 1896. Therefore, each grain has a smaller purchasing power. Now, if Professor Fisher's plan had gone into effect in 1896, each gold dollar at the present time would have an increase of 50% of its weight. In other words, every gold dollar would contain virtually 38.7 grains of gold and would therefore, by virtue of the

increase, have a purchasing power equal to that of a dollar in 1896. The accompanying diagram, prepared by Professor Fisher, shows the comparison between the actual course of prices in the United States during the past fifteen years and what it might have been with a compensated dollar.

How is this compensated dollar to be obtained? It is of course absolutely impracticable to be continually recoining the gold in circulation, sometimes adding more gold, sometimes using less. That system is impossible. Also it would be impossible to return to the level of prices of fifteen years ago. Rather must we take the scale of prices of to-day as a standard, call the purchasing power of the dollar of to-day a standard, and prevent any further rise of prices, or decrease in the dollar's purchasing power, by virtually adding, from time to time, more gold to the dollar to compensate for the lessening purchasing power of each grain of gold. The actual gold coins would, of course, still contain 25.8 grains of gold, but they would be mere gold certificates printed on gold instead of paper. Their value would be, like the paper notes, based upon the amount of bullion gold for which they would be redeemable at the mint. Thus when the purchasing power of gold depreciated, the weight of the gold dollars would be increased, in that both the gold coins and the national notes would be redeemable at an increased rate to compensate for the loss of purchasing power. This excess of bullion over the actual weight of the gold coins would be similar to what used to be termed "seigniorage". Thus this new plan actually restores the old custom of seigniorage on gold coins. Also we see that this plan calls for absolutely no change whatever in the currency of the country. But while it is not necessary that the gold in the gold dollar be equal to that in the "virtual" dollar, yet it is absolutely necessary that the coin dollars be redeemable in bullion on demand. In this respect they are like the treasury notes. This intraconvertibility of the "token" dollar with the actual gold bullion is, of course, the very basis of the gold standard. Under Professor Fisher's plan a gold dollar, or a gold treasury note, would be redeemable not for 25.8 grains of gold bullion as at present, but for the number of grains which, according to the index numbers, constituted the virtual dollar. As to converti-

bility in the other direction, the mint would buy gold at a price one per cent less than the value of redemption bullion. In other words, the mint would issue gold dollars, or gold certificates, for the weight of gold forming the virtual dollar plus a one per cent "brassage". The "brassage", as the term is used by Professor Fisher, would constitute a coinage fee.

These two separate prices—mint-price, or the price the mint pays for bullion, and redemption-price, or the price at which the mint will redeem gold certificates—are necessary to prevent gold speculation at the expense of the government. For, should the government buy and sell gold at the same price, every expected increase or decrease in the price of gold would undoubtedly lead to speculation which would be very embarrassing to the government. For example, should the price of gold on one day be eighteen dollars per ounce, if it were known that tomorrow the price would be raised to eighteen dollars and fifty cents per ounce, speculators could easily buy gold one day of the government and sell it back the next at an advance of fifty cents per ounce. The only protection for the government from this embarrassing speculation would be to charge a slightly higher price for gold than it pays. Provision is also made that this pair of prices shall shift by no more, at any one time, than the margin between them. Thus we see that the plan is to readjust, from time to time, the pair of government prices, keeping always between them the constant margin of one per cent "brassage".

The most important factor of this system—the increasing or decreasing of the amount of gold in the "virtual" dollar so as to retain a standard value in purchasing power—works automatically by means of statistics called "index numbers of prices". These statistics are to-day compiled and published by the United States Bureau of Labor, by the British Board of Trade, by the London *Economist,* by the Canadian Department of Labor, and by Bradstreet's and other commercial agencies. The statistics of the United States Bureau of Labor are based upon the wholesale prices of 257 commodities. They show from year to year the extent of fall or rise of the prices of these commodities on the whole. The index number of prices is the number which represents the average amount of rise or fall for all these 257. Pro-

fessor Fisher's plan is to have these statistics compiled periodically and published with the actual prices on which they were based. Then any time that the official index number shows a rise of one per cent in the price level, it would be a signal for the increase of the virtual dollar by one per cent.

A brief outline of the plan may, perhaps, enable the reader better to grasp its important points. In short, then, Professor Fisher's proposal is to institute an official index number of prices, such as is now compiled by the Bureau of Labor, to select some initial year and call the price level of that year one hundred per cent. After that year the government would vary the weight of the virtual dollar (redemption-bullion), at stated regular intervals, to compensate for the varying purchasing power of gold as shown by the index number. That is, any month that the index number rises above or falls below par, the weight of the virtual dollar would be changed in proportion to such deviation. No change in the weight of the virtual dollar should, however, ever exceed the stated "brassage" (of say one per cent). Also the virtual dollar must never in any case be less in weight than the coined dollar. Finally, to maintain the gold standard, the government must at all times redeem, on demand, gold coins or certificates in bullion at the redemption price. And also the government must at all times buy gold bullion at the mint price, which is the redemption price less the brassage.

Thus the system would work automatically of itself. By having the index numbers published quarterly, or, if necessary, monthly, the change in weight of the virtual dollar would keep pace with the change in price level, and thus maintain the virtual dollar at a standard value in purchasing power.

Professor Fisher's plan has been widely commented upon and has been endorsed by many of the leading University Presidents, Professors of Economics and Social Sciences, Bankers, Business Men, and Financial Journals in both this country and England.

In a special message to Congress, President Taft recommended a plan for an international conference regarding the high cost of living. The final bill for this project, after being unanimously favored by the Committee of Foreign Relations, was passed unanimously by the Senate of the United States on April 15th,

1912. An identical bill in the House of Representatives has been unanimously favored by the Committee on Foreign Affairs in their report on May 15th, 1912. The bill in the House, however, has not yet been voted upon. The aim of this project for an international conference is for an unbiased and scientific inquiry into the cost of living. That the great advancement in prices has not been confined to the United States is proved by the fact that the leading political economists, business men, commercial bodies, and economic societies of all the countries of Europe have placed themselves on record as favoring the formation of this international commission. This conference, if the bill passes the House, will consider the causes of the increasing cost of living and any possible remedies which may be applied. It is to be hoped that the conference will be called and that they will consider favorably Professor Fisher's plan for a compensated dollar.

# THE EARLY HISTORY OF YALE

*E. B. Dickinson.*

BY 1700, New England had grown to such an extent that the educational opportunities afforded by Harvard University were inadequate. This fact, coupled with certain theological and political differences between the Colonies of Connecticut and Massachusetts Bay, may have been responsible for the growing feeling at that time in favor of the foundation in Connecticut Colony of a new college. In the early summer of 1701, the Rev. James Pierpont, a Harvard graduate, who was the chief advocate of the new movement, and his friend, the Rev. Abraham Pierson of Clinton, Conn., sought the advice and enlisted the aid of the principal clergymen and laymen of the Colony for the new project.

About the last of September, 1701, a few Connecticut pastors gathered together at Branford and agreed to give a collection of books as the foundation for a college in the Colony. At this same time a general plan for the new institution was worked out, and a charter was framed, to be applied for at the next meeting of the legislature. At a meeting of the legislature held some two weeks later the efforts of Pierpont and Pierson were rewarded and the charter, which was entitled "An Act for Liberty to erect a Collegiate School", was granted. Probably no great enterprise has been founded on a more humble basis than was Yale University. Organization under the charter took place the following month, when seven trustees met in Saybrook, Conn., and decided to locate the school there, with Mr. Pierson as rector. A course in theology was mapped out, and the provision made, that in all matters not provided for, the rules of Harvard College were to be followed. In March, 1702, the first student, Jacob Heminway entered, and in September the first Commencement was held, at the house of the Rev. Thomas Buckingham in Old Saybrook, Conn. Degrees were conferred upon four young Harvard graduates, at this Commencement, and also upon Nathaniel Chauncey, of Stratford, who had been privately tutored by one of the trus-

tees, and whose name, therefore, heads the list of Academical graduates of Yale University. At this same time eight students entered the college, and Mr. Daniel Hooker, a Harvard graduate, was appointed to assist in the instruction. Shortly afterwards Mr. Nathaniel Lynde offered a small house and lot on Saybrook Point for the school's use, and for a time all the activities were centered about it.

Up to this time the college had depended for its support entirely on the tuition fees of the students and the annual income of £80 from the Colony, but in 1713 efforts were begun to secure gifts for the school, as a result of which a valuable library was sent over from England. Chief among the donors was Elihu Yale, who at this time first became interested in the College. Soon afterwards the Colonial Assembly was petitioned for means to erect a building, and in 1715 a grant of £500 was made for this object. With the means for erecting a building at hand, the next question to come under consideration was the location. Great rivalry arose in Saybrook, Hartford, and New Haven, as to where the college should be located, but the popular subscription in New Haven had reached a higher figure than in either of the others, and in October, 1716, it was decided to locate there. A strip of land was purchased at the southeast corner of the present campus, and a three story building was erected. When the time came to move the college library and records from Saybrook into their new quarters, the men in whose charge they had been left were so indignant over the change in location, that they refused to give them up. A sheriff was called in and in the struggle which ensued, about one-fifth of the library was destroyed, as well as the records of the trustees.

In 1718 Governor Yale added to his former gifts by sending over a cargo of merchandise valued at £563, and which, when sold, added greatly to the income of the college. At Commencement of the same year, the name was changed from Collegiate School to Yale College, in recognition of Governor Yale's generosity.

At this time great progress was made; a President's house was built, and numerous gifts were received. Chief among the donors

was George Berkeley, who had hoped to found a college in Bermuda, and upon the failure of his project, had given to Yale, as a foundation for graduate scholarships and undergraduate prizes, an estate near Newport, and had also contributed some nine hundred volumes to the College Library.

In 1745, during the administration of President Clap, a new charter was drafted and passed the legislature, which put Yale College on a far firmer basis than would have been possible under the old.

From that time on the College seemed to shake off the burdens which had held it down, and grew and developed in a manner beyond the fondest expectations of those who had first conceived the plan, and had been instrumental in its foundation.

THE ACME AUTOMATIC SCREW MACHINE,
WHICH WAS RECENTLY ON EXHIBITION AT THE MASON LABORATORY.

# THE FOUNDATION OF THE YALE ART SCHOOL

*Harold L. Wadsworth.*

THE first important art collection which was exhibited in Connecticut was opened to the public in 1831, under the control and supervision of Yale College. This collection consisted of a few works of art which the College had gathered from time to time. The most notable pictures were Smyhert's "Dean Berkeley's Family" and those of the Trumbull Collection. The latter collection came into the possession of the College under rather peculiar circumstances. Colonel Trumbull, being a widower and finding old age impairing the cunning of his right hand for productions, half in anger, half in melancholy generosity, offered his entire remaining collection to Yale College on condition that he should receive fifteen hundred dollars each year for the remaining years of his life. This offer was readily accepted and it hastened greatly the steps to be taken before the gallery was formally opened to the public.

The Trumbull Collection has many valuable assets. It consists of several large pictures and two hundred and fifty portraits. The portraits are especially valuable for they are of the most prominent men of the Revolution. Colonel Trumbull was personally acquainted with them and most of the pictures are painted from life. They are the first replicas, made while collecting portraits for his famous historical works.

Art was greatly advanced in the University by an incident which occurred in 1858. Members of the Linonian Society, having determined to spend a certain amount of money on a work of art to adorn their hall, asked Frederick Bartholomew, a sculptor then in Rome, to make the selection. He purchased copies of the marble statues, "Demosthenes" and "Sophocles". In order to welcome the new acquisition, the University held a loan exhibition for two months in the summer of 1858. The exhibition aroused such enthusiasm and general interest that the officers and friends of Yale recognized the important influence which art, as a branch of study, might have upon the college students.

A course of lectures on art were delivered and this led to the desire of a separate department of art in the University. However, not until the summer of 1863 was the way opened for such a movement. At that time, Augustus Street of New Haven, partly at the suggestion of Nathaniel Jocelyn, offered to erect at his own expense, a building to be devoted to art and artistic studies. The corner-stone for this building was laid in 1864 and two years later the building was completed.

FOUNDED IN 1864.

One year after the completion of the Yale Art School, it received a most remarkable collection. Rarely ever is such a comprehensive study of Italian art to be found outside of the European galleries as Mr. James Jackson Jarves' collection. It is most extraordinary that such an exceptional collection should receive so little attention. Mr. Jarves made this collection during his long residence in Italy, and before it was brought here it was shown in Florence. It was brought to this country early in the sixties, a time when appreciation for the beautiful was lacking in every respect.

By no means is this collection a group of masterpieces, and it was not Mr. Jarves' intention to have it such. The purport was to get together a series of pictures, which would characterize the masters and schools, for the study of early Italian art. Mr. Jarves has most certainly succeeded in carrying out his intention and, aside from the authenticity of the pictures, they show a remarkable knowledge and judgment in selection.

Two of the three rooms which are devoted to pictures in the Yale Art School are occupied by this collection. These pictures

NEW ADDITION IN HIGH STREET.

cover a period from the tenth century Byzantine to sixteenth century Venetian painters. The very earliest Byzantine work is represented in this collection; showing the crucifixion on a Y-shaped cross. The great advancement which Cimabue made over Margharitone's stiff Byzantine manner is shown. An altarpiece by Giotto gives some idea of his style.

Very great care has been taken in choosing the links of the early schools, making it impossible to mention all the pictures

worthy of praise. Pictures by Taddeo Gaddi, Orcagnas, and Agnolo Gaddi are all very interesting. A fascinating cassone picture, "The Triumph of Love", which shows a host of distinguished personages who have succumbed to the fatal passion, is credited to Gentile Fabriano. Slowly the paintings become of more modern schools and masters. A very interesting picture of St. John the Baptist as a child, gives us a good conception of Masaccio's work. Two paintings by Sano di Pietro, whose

PART OF JARVES COLLECTION.

works are seldom seen outside of Sienna, advance the style a little. A canvas transferred from wood to oil, a crucifixion with the Virgin and St. John beside the cross, is said to have been done by Squarcione and one of his pupils. A picture by Filippino Lippi follows. Although Signorelli is best shown in fresco, there is a good example of his work in "The Adoration of the Magi". Next is a picture by Francia, and Perugino is represented in an oil painting. A charming Botticelli and a Giovanni Bellini,

showing his early style, brings us to a still later period. Then there are two very remarkable paintings by Giorgione, which are followed by one of Raphael's earliest works, two Sodomas, one of which shows an exceptionally characteristic painting of Christ bearing the cross. In this collection there are few pictures from the Venetian school, and the few that are included are not extremely good examples. The work of Guido Reni, shown in two pictures, is the termination of this marvelous collection.

This collection of Mr. Jarves covers a period of six centuries and contains one hundred and fifteen pictures. It is remarkable that a collection which presents such a wonderful opportunity for the study of Italian art should be known by comparatively few. Mr. Jarves has gathered, with infinite skill and patience, from Margharitone to Guido Reni, this exceptional collection and brought them to a people who did not have them as a birthright.

HILLHOUSE AVENUE.

# THE GOVERNMENT APPROPRIATION FOR THE NAVY

*Geo. G. Titzell, Jr.*

EXPERIENCE has shown the wisdom of systematic preparation for war. If we wait until a crisis comes, it is then too late to make effective preparations, and the result is confusion, waste and unnecessary loss of life. In any war involving the United States the control of the sea will be of the utmost and deciding importance. Such control can be obtained only by an efficient navy of sufficient strength.

If an efficient fleet of adequate size is maintained the country will be safe from attack and free to work out its destiny in peace. The recommendation for a continuing policy which will give the fleet desired is made with due regard for the almost world-wide movement for the settlement of international disputes by arbitration, a movement in which this country has taken a foremost part. History of all times shows the futility and danger of trusting to the good will and fair dealing, or even to the most solemnly binding treaties, between nations for the protection of a nation's sovereign rights and interests; and, without doubt, the time is remote when a comparatively unarmed and helpless nation may be reasonably safe from attack by ambitious, well armed powers, especially in a commercial age such as the present. The economical system of a great commercial nation is so delicately balanced that even a threat of war is very disturbing and harmful, while a war with any other great power would cause incalculable damage. No person of intelligence who has studied international policies can be blind to the fact that the possession of great wealth, resources and population does not carry with it immunity from attack, should a nation's interests clash with those of another better prepared.

A total of 41 Battleships, with a proportional number of other fighting and auxiliary vessels, is, in the opinion of the Secretary of the Navy, the least that will place this country on a safe basis in its relations with other world powers. At present our navy

consists of 33 battleships, with cruisers and gunboats making a total of 225 ships.

The mobilization of the fleet in 1912 demonstrated the need of battle cruisers and smaller vessels, such as scout destroyers, gunboats, submarines, colliers and ammunition ships. The department of the navy distinctly recognizes the value of torpedo craft and submarines, but is of the opinion that until more of the old battleships are replaced, it is wiser to provide for battleships than to sacrifice battleship strength for vessels of less military value.

Nowadays, only so-called dreadnoughts and battle cruisers are considered in estimating naval strength. These are called capital ships, and in a few years, if the powers do not increase their present programs, and if Congress authorizes only two capital ships every year, the United States will have dropped from second to fourth on the list.

SUMMARY OF OUR NAVY.

| | |
|---|---|
| Battleships | 33 |
| Armored cruisers | 10 |
| Cruisers | 27 |
| Special type | 17 |
| Gunboats | 33 |
| Naval militia vessels | 6 |
| Destroyers | 40 |
| Submarines | 23 |
| Fuel ships | 20 |
| Torpedo boats | 16 |
| Total | 225 |

Of course no one desires to have battleships merely for the pleasure of feeling a power to control other nations. No one wishes battleships for the purpose of promoting war or leading to international controversy. We provide a navy as we provide insurance against a possible loss or a danger which we hate to anticipate, but which under present conditions we should be foolish not to treat as possible. There are a great many conscientious

peace lovers who resent the expenditure of a dollar for a battleship. Their theory is that we can reach a peaceful solution of international contests earlier if we begin the disarmament and make ourselves physically helpless before the nations of the world. They believe that this, by way of example, will lead other nations to the same course and so ultimately accomplish the purpose of all of us, which is the settlement of all international controversies by peaceful means. The world has not yet reached the point where advantage would not be taken of our inability to resist attack, or to meet other nations on an equal plane in war. It is, therefore, essential that we increase our navy, in order that we should preserve our prestige by the exhibition of actual power of resistance and of attack, until, through our influence, and with all other nations equally anxious to bring about peace, there shall be substituted some sort of tribunal, court or board of arbitration before which any nation shall be enabled to call any other nation to answer, and to execute any judgment delivered against it after a hearing.

It has been erroneously stated that the canal will double the fleet. It will increase the efficiency of the fleet somewhat because if the fleet is on this side it will reduce the time necessary to bring it around to the Pacific coast, but it does not increase the number of ships. With an immense coast line, and with the whole of South and Central America to separate the east from the west coasts, this country would otherwise need double the fleet of a country whose coast line is continuous.

In times of peace it is pointed out that there will be no more wars, but history shows that wars come at times with little or no warning. There is no time left to build battleships, and it is impossible to buy them ready made. Congress should provide the auxiliaries, destroyers, etc., that go with the battleship fleet, but when war comes, the auxiliaries will not go out and sink the battleship fleets. Only battleships can do this work.

Three battleships are included in the estimates for this year. However, these will simply replace four battleships which will be twenty years old in 1914, and will then have to be withdrawn from the second line. Thus they will not constitute a numerical

increase in the present strength of the fleet. The United States has only two transports that are now available for duty. The one is twenty-two years old and the other twenty. Both are single-bottom ships and entirely lacking in water-tight subdivisions, having been originally designed as freighters. We have only one small makeshift vessel for ammunition-carrying purposes. The construction of others cannot longer be delayed with safety. The three supply ships now serving the Atlantic and Pacific fleets are more than twenty years old and cannot be expected to give much further service. There should be one modern supply ship for each eight battleships. The navy possesses an insufficient number of gunboats to perform effectively the service required of it for the protection of American interests in Central American and West Indian waters, and in the Far East. With one exception, no gunboats, other than for river service, have been added to the navy since 1902.

Although the aeroplane has not yet arrived at the state of perfection required, it is sufficiently advanced to be of great service in many ways, and its satisfactory development for extensive naval use is expected at an early date. The following statement will serve to show the comparative interest that is manifested in aviation today by some of the powers:

GOVERNMENT APPROPRIATION.

| | |
|---|---|
| France | $6,000,000 |
| Germany | 1,500,000 |
| Russia | 5,000,000 |
| Great Britain | 2,100,000 |
| Italy | 2,000,000 |
| Japan | 600,000 |
| United States | 140,000 |

It is requested that Congress remove these limits and thus permit the expenditure of as much as is necessary to continue progressive development and adaptation as rapidly as circumstances permit, with due regard for economy.

The necessity for admirals and vice-admirals for a properly administered fleet should receive immediate attention from Congress. No provision is now made for any except the lowest grade

in flag rank, that of rear-admiral. The recognized grades, in order, are admiral of the fleet, admiral, vice-admiral, rear-admiral. The fact that the grades of admiral and vice-admiral do not exist in our navy is inconsistent with the size of our fleet and with the dignity of this country. When it is realized that nineteen of the navies of the world include at least vice-admirals,—nine of them admirals,—and Japan, Germany and England, admirals of the fleet in addition, it is felt that this matter should be corrected in our service by appropriate legislation. For at present, in any combined operations or international functions where naval forces are present, the United States would now take the lowest place in rank.

The paramount need of the navy is for battleships and the future program does not recommend any modification of the building plan which will ultimately interfere with the battleship strength, and, above all, the United States ought not to indulge the persuasion that, contrary to the order of human events, they will forever keep at distance those painful appeals to arms with which the history of every other nation abounds.

# A COMPARISON OF THE PRICE OF STUDENT'S BOARD IN VARIOUS UNIVERSITIES

*W. Seymour.*

IT is the purpose of this article to compare the prices charged for a student's board at some of the different universities. In order to get an idea of the conditions that generally exist throughout the country a wide geographical range of colleges has been investigated. One would quite naturally suppose that in these days of quick and cheap transportation differences in the price of board in various parts of the country would not be great. Investigation, however, tends to prove the contrary. In considering this problem we are going to eliminate from the discussion a certain class of students who make it a practice of dining at various cafés and hotels and paying a great deal more than is necessary. In other words, there are in every college wealthy men who like to live up to their means, and this class has not been considered. Information has been secured from the chief institutions in their respective sections of the country.

It should be understood that any exact figures in any one of the colleges could not be obtained, but the best statistics available were used. These consist of those compiled by the Commons or college dining halls, by boarding houses and in the western universities by the fraternity houses, in which the men there eat to a large extent.

As Illinois and Michigan are two of the largest middle western schools they have been used to represent the conditions in that section of the country.

The University of Michigan has no Commons. Most of the men there board in either the fraternity houses or private boarding houses. Inquiries sent to several of the largest boarding houses show that students pay about $4.00 per week. Most of the fraternity houses charge more than this, the average being in the neighborhood of $4.50 per week. However, since the number of men eating at the places from which these figures were taken is comparatively small, in contrast with the total enrollment of the

whole university, any average based on them is bound to be somewhat inaccurate. Nevertheless, it is impossible to obtain other figures as there are a great many small restaurants and lunch counters, and fraternity houses. Often the men dine at a place at which no record of attendance is taken.

MEMORIAL HALL, HARVARD UNIVERSITY.

However, in order to get a general average for this University, the number of students was multiplied by the figures that were obtained; which resulted in the price of $4.10 for the general average for Michigan.

Now let us consider the conditions at Urbana. The cost of living at the University of Illinois is the lowest of any of the col-

leges consulted. Here, as at Michigan, there is no University Commons, and the men eat at the different boarding houses, lunch counters and fraternity houses. Often the men dine at the place where they room, and one price is charged for both room and board. But fortunately for our purposes, this number is not great. The American plan, by which the students pay so much per week and obtain to eat whatever is set before them, is found at Illinois. This plan does not permit much choice, and perhaps is one of the reasons for the low price. Figures obtained from this university quote the price of board as ranging from $144 to $162 per collegiate year of ten months, which gives a weekly average of about $3.75. To an Easterner this figure seems incredible. The charges for linen, service, etc., only at the Yale Dining Hall last year were $3.25 per week, showing a marked contrast with the prices at Illinois.

Before discussing the eastern colleges, let us consider the far west. The University of California has been singled out from the others to represent this section. California, like Michigan and Illinois, lacks a University Dining Hall. In order to protect the students, the faculty has made a list of what are known as "approved boarding houses". Inspection as to the sanitary conditions and fire safety of these houses is carried on by the University, for which a fee is charged. In turn the proprietors charge more in these places than in the ones not officially listed. A fair average of the prevailing prices in these approved houses is about $5.50 a week. Prices in the others are a little lower, and the estimated general average is about $5.00 per week. This is found to be nearly in accordance with prices in the eastern schools.

The eastern colleges have been divided into two classes, one class consisting of those institutions which may be called inland colleges, in order to distinguish them from those on the Atlantic sea board, which will be considered by themselves as the second class. Cornell and Dartmouth have been chosen as representing the conditions that prevail in the former class.

Statistics were compiled by the faculty at Cornell in 1896 and again in 1912 with the idea of showing the trend of prices. These figures show that while the price of lodging has remained nearly stationary, the price of board has materially risen. In 1896 the

average price paid for board at Cornell was $3.46. Figures for 1912 were obtained from replies sent in by 3,249 students, and may be considered as accurate. The average price paid by this number was $4.53 per week, which is an increase of 31 per cent. The great rise during this short interval of sixteen years is noteworthy. Most of the students at Ithaca eat at fraternity houses or private boarding houses. Cornell, like the western colleges, does not own a Dining Hall, although most of the eastern institutions do.

At Dartmouth the Comptroller of the Dining Association has just finished completing an investigation of the average price paid by students at the Commons. The Dining Hall is divided into two parts, the grill room and the regular dining room. It is reported that students eating in the grill room pay on the average of $4.68 per week, which is a little higher price than that paid by those boarding at the dining room. In the latter place the average is $4.01. In both places the European plan is used entirely, there being no fixed charges, and the student pays only for what he orders. Investigation in the private boarding houses and fraternity houses reveal the fact that men in these places pay practically the same rate as in the grill room. Approximately the entire college boards at some one of the places mentioned; therefore figures based on these places are nearly correct. The general average for the college is about $4.50, which is practically the same as at Cornell. An interesting fact is that these two colleges are usually called eastern universities and yet their prices differ materially from those on the Atlantic seaboard.

Lastly we will consider the universities that interest a Yale undergraduate most; namely, Yale, Harvard and Princeton. We find that the student at any of these places has to pay considerably more than at any of those previously considered.

At Princeton the Sophomores and Freshmen are required to eat at the University Commons in order to enable the men to become better acquainted with each other. The plan in use at the Princeton Commons is strictly table d'hote, $5.50 being the fixed charge per week. There are no extras. The upper classmen may eat where they will. Probably the majority of these board at private clubs, where the prices range from nine to ten dollars

a week. All of this, however, is not for board alone, since charges for service, tobacco and other things are included in this sum. The Registrar at Princeton estimates that the average cost of food alone in the clubs is between $5.50 and $6.00. Taking into consideration the number of men eating at the respective places and the amounts paid at each, one is able to obtain the figure $5.60 as the approximate average for the University taken as a whole. This sum, as may be seen by comparing the conditions at Yale and Harvard, is typical for the colleges on the Atlantic seaboard.

We find at Harvard two Dining Halls run as separate institutions, with the prices differing in each one. At the larger one, known as Memorial Hall, a combination system is used which embraces features of both the European and American plans. There is a fixed charge of $5.25 per week, which covers practically all that one will want, but for those who desire anything additional there is furnished an á la carte list. In this way it is possible, at a slight additional cost, to get extras. Extras are bought by the students to an average of about fifteen cents a week which, added to the fixed charges, brings the sum up to $5.40 as the average for the University Dining Hall. Again, as at Princeton, the private clubs and boarding houses have to be taken into account. Nevertheless, this does not alter the situation, for the prices in these clubs equal, on an average, those of Memorial Hall. It is, therefore, safe to assume that the rate given for the Commons is a fair one for the entire University. It will probably be surprising to the student who is used to unlimited credit at our own Dining Hall to learn that at Harvard before credit is extended to a man he must file a bond of $400.00 with the bursar. Those willing to pay cash are exempt from putting up any security.

Returning to home ground, we will try to determine what the average paid at Yale is, and see how this sum compares with the others. In this case only a short survey of the various eating places is necessary, since most of the student body is familiar with the majority of them. First and foremost of these is the Commons or University Dining Hall. The latest figures compiled by the manager of that institution show in the year 1911-1912 an average of 800 students ate there for that year. His

report further revealed that they paid on an average of $5.34 per week. Of course many of the students are able to board at Commons much cheaper than this, as we, like Harvard, have a fixed rate as well as an á la carte list. The fixed rate for the year mentioned was $3.25, covering such items as soup, coffee, bread, service, etc. The fixed rate at Yale does not provide, however, nearly so extensive a menu as at Harvard, a fact which accounts for the difference in the two. The extra charges bring the average of the Yale Commons only six cents lower than that of Harvard. Furthermore at Yale nobody is compelled to pay cash, as all extras are paid for by tickets, which may be secured at the office, and charged to the student's account.

At Yale as elsewhere a large proportion of the students eat at boarding houses and lunch counters, and these must be considered in order to determine the general average for the University. The prices asked at the principal boarding houses range from $6.50 to $8.00 per week, with the average at $7.00. But this sum is lowered by students eating at lunch counters, or 'dogs' as they are commonly called, because here the average is between $4.75 and $5. Taking all the places that have been mentioned into consideration, a conservative estimate of the general average for the whole University is $5.50 per week, which corresponds very closely to that of Princeton and Harvard, and may be taken to represent the prevailing conditions in this part of the country as far as a student's board is concerned.

Columbia has purposely been left out of the discussion because it is located in New York City. Many of the students live at home, and the rest are scattered too much to be able to get any reliable information. Another reason for the omission of this university is that the prices in New York seem to be higher than in the surrounding country.

From what has been said it is obvious that the Middle Western colleges pay less than any of the others, with amounts increasing the further east you go. What is the cause for this? Surely not transportation differences. The real reason seems to be that the standard of living in the Eastern schools is higher than in the Middle West. It is doubtful if the Yale or Harvard man would be satisfied with the board and boarding conditions of the Western students.

# RAILROADS

*J. Hunt.*

THE average college man has but a hazy idea of where the United States stands, in relation to the rest of the world, in regard to railroads. The purpose of this article is to show where our country stands in the various phases of railroading and to attempt to give some idea of the extent of our systems.

The subject of railroads is a very big one. Consider how much they have had to do with the advance of civilization. One can scarcely conceive of our country without them. We owe the food that we eat, the clothes that we wear, almost everything we have to the direct or indirect influence of the railway. Yet the first one was built less than a century ago. We accept as too much of a matter of course, the train which we periodically take to New York or Boston. Consider for a moment what went to make up the vehicle which carries us. We speak of building a railroad without realizing the immense difficulties which the constructors are obliged to undergo. Not considering the cases of railroads being built in entirely unknown countries where human enemies cause much danger, even in building a new railroad in our country at the present day, tremendous obstacles must be overcome. A few figures will prove this point. Leaving out of consideration the cars, engines, stations, preparation of roadbeds, etc., the following materials are needed for the construction of one mile of railroad track. For the sake of convenience, we will assume that 30-foot rails are laid with six spikes to each tie and six holes to each splice. The following are absolutely necessary:

| | |
|---|---|
| Ties | 3,520 |
| Tie plates | 7,040 |
| Spikes | 21,120 |
| Kegs | 57 |
| Rails | 352 |
| Splices | 704 |
| Bolts | 2,112 |
| Fence posts on each side (586 in all) 18 feet apart... | 293 |

These approximate figures should give a fair idea of the magnitude of the work.

In the first place, it is well to know how the United States compares with the remainder of the world in the matter of mileage of track. We have by all odds the largest railroad system in the world. The latest available statistics place the number of miles of the lines at 244,089.14 miles, or, including second tracks and sidings, 359,030.03 miles. On the other hand, the whole continent of Europe, the most highly developed and most densely populated of the continents, has approximately 200,000 miles of direct lines of track. Some figures, which were compiled several years ago, give a good idea of our position in this regard. At that time the mileage of the United States was estimated at 241,000. The next nine countries were: Russia with 41,000; the German Empire with 38,000; India with 32,000; France with 30,000; Austria-Hungary with 27,000; Canada with 25,000; the United Kingdom of Great Britain and Ireland with 23,000; Australia with 17,800; and Argentina with 15,850. These figures are approximate and exclusive of the extra number of tracks on one line and of the sidings. Another interesting comparison which statistics afford us is by continents. A table, prepared on the basis of the 1909 figures, gives the mileage of the entire world to be 625,698 miles. Europe had 204,904; Asia 61,800; Africa 20,809; Australia 18,849; South America 42,329; and North America 277,015. The above figures readily prove that the United States is far ahead of the other countries of the world in the matter of amount of railway mileage. It has been estimated that since 1886 our mileage has increased, on the average, over 10,000 miles per year.

The next thing to be considered is in regard to the number of locomotives and cars in use. It is logical that a country having so many more miles of track in use should also necessarily employ more cars and locomotives. Unfortunately statistics are not available as to the number in use in the various foreign countries, except in the case of the United Kingdom, but, nevertheless, that example will serve to demonstrate the fact. In 1911 the number of locomotives in use in the British Isles was 22,874, and the number of cars of all kinds was 840,613. These figures of course exclude tramways and the like. During the fiscal year

ending June 30, 1911, there was the following number of rolling stock in use in the United States:

| | |
|---|---|
| Locomotives | 61,327 |
| Cars:— | |
| Freight | 2,359,335 |
| Passenger | 49,818 |
| Company service | 114,006 |

In addition to the advantage of mere numbers, the railroads of our country have another advantage. In the case of freight cars, ours are considerably bigger, better constructed and more efficient than those of any other country. We have proportionately by far the greatest number of steel cars. Our passenger cars, in addition, are better constructed than those anywhere else. An interesting instance of the effect of politics on industry is shown by the falling off of car-building in 1911. At that time there was a great deal of legislation and agitation about rates and as a consequence the railroads did not know whether they were going to lose a lot of their trade or not and did not have many new cars built. In 1907, the high year of car-building, there were built in the United States: 7,362 locomotives; 284,188 freight cars; and 5,457 passenger cars. In 1911 the statistics show that only 3,520 locomotives; 55,931 freight cars; and 3,566 passenger cars were built. The last year, however, has seen marked improvement in this industry.

Very few people realize that the aggregate number of railroad employees in the United States exceeds one and one-half millions. The number in 1911 was 1,669,809. This means that, on the average, there are 678 men to each mile of track. The average daily compensation of the American railroad employees is about $2.08. The number of the employees is considerably more than a fourth of the total population of the Dominion of Canada.

As far as the comparison has gone, the United States has very evidently had the advantage of it, but we now come to a point where the comparison is not so favorable to us, namely the consideration of the number of railroad accidents. It must needs be admitted that railroad accidents are more frequent in the United States than in any other place. There are several explanations

of this fact. One is that the American trains are on the average faster than the European trains. This is due to that American trait, love of speed, perhaps, and also to the size of the country and the necessity of quick communication. Whatever the cause, however, such is the case. The circumstances are not just the same. Much of Europe is very thickly populated, at least that part where the majority of the railroads are, and towns are too near together to permit of conditions like those in certain parts of our own country. In certain parts of Europe there are some very admirable safety devices. For example, in Germany and Switzerland on some of the railroads there are little sentry boxes at regular intervals alongside of the track. There is a man assigned to patrol between each box and its nearest counterpart, and to watch out for any bad places in the track, and to generally take care of the track. Similar care is taken of track in some parts of the United States, though perhaps not as thoroughly. About 73,000 miles of track in the United States are equipped with the block system.

At any rate, there are more railroad accidents in our country than in any other, even when one takes into consideration the fact that there are a great many more railroads. Taking the British Isles as a basis of comparison, in 1911 there were 1,070 killed and 8,345 injured in railway accidents. Figures follow which show the number of accidents to individuals in the United States during the fiscal year ending June 30, 1912:

Killed—10,585; 318 passengers; 3,635 employes; 6,632 other persons, trespassers and non-trespassers.

Injured—169,538; 16,386 passengers; 142,442 employees; 10,710 other persons, trespassers and non-trespassers.

Curiously enough, as will be observed from the figures, the greatest number of victims comes neither from the passengers or the employees. It might be supposed that quite a number are children who are run over, but the average age of Americans killed in railway accidents last year was 37.5. It will readily be seen that the number of accidents in America is all out of proportion.

Before proceeding to the last main topic of this article, namely the financial aspect of the railroads, it might be well to explain the vast amount of freight carrying done by American railroads.

This is quite easy to understand, since besides being such a large country, the United States is so specialized in various communities as to necessitate reciprocal commerce between the states. In 1911 there were carried one mile 253,783,701,839 tons of freight in America. On the other hand, we do not carry as many passengers annually as the railroads of the British Isles. In 1911 their trains carried 1,326,317,000 people, while our roads only transported 997,409,882. This is probably due to the exceedingly dense population of the British Isles.

We come now to a consideration of the financial side of railroading. In the first place our railroads, as compared to those of Europe, present some interesting facts. The figures on which the comparison is based are not those of last year, but of several years ago. They show that there are 57,352 more miles of track in the United States than in the whole of Europe, but that the European railroads cost more to build. The capital or cost of construction of the European railroads is about $22,492,218,-315; that of our own but $15,008,707,570; an excess of cost to the Europeans of $7,483,510,745. In fact the railroads of that continent cost practically twice those of our country, their average cost per mile being $126,859; ours but $63,944. It is thus evident that the building is much more expensive over there. It is a well-known fact that the roadbeds of Europe are very good, however, while many of ours have been criticized.

In conclusion, it may be well to include a few general figures about the railroads of the United States. They are pretty good paying propositions. In 1911 they earned on the average 5.13 per cent on outstanding capital stock. This is all the more important when one realizes that between the years 1904 and 1911 the taxes on railroad property increased 109 per cent. Last year the railroads, on the average, received 1.974 cents per passenger per mile, and .757 cents per ton of freight per mile. The following figures present clearly the finances of the railroads of the United States:

| | |
|---|---|
| Total Assets .................. | $22,515,975,092 |
| Total Liabilities ............... | 21,360,145,156 |
| Excess of Assets over Liabilities.. | 1,155,829,936 |

| | |
|---|---|
| Operating revenues ............. | $ 2,789,761,696 |
| Operating expenses ............. | 1,915,054,005 |
| Operating revenue (net) ........ | 874,707,691 |
| Gross corporate income (including investments) ............... | $ 1,082,747,592 |
| Net corporate income ........... | 491,111,067 |
| Total capitalization (par value)... | $19,208,935,081 |

We have now considered the railroads of the United States, largely in a comparative way, with regard to mileage, equipment, number of employees, accidents and finances. We find them in general to be in a better condition than those of any other country.

# THE CATSKILL AQUEDUCT

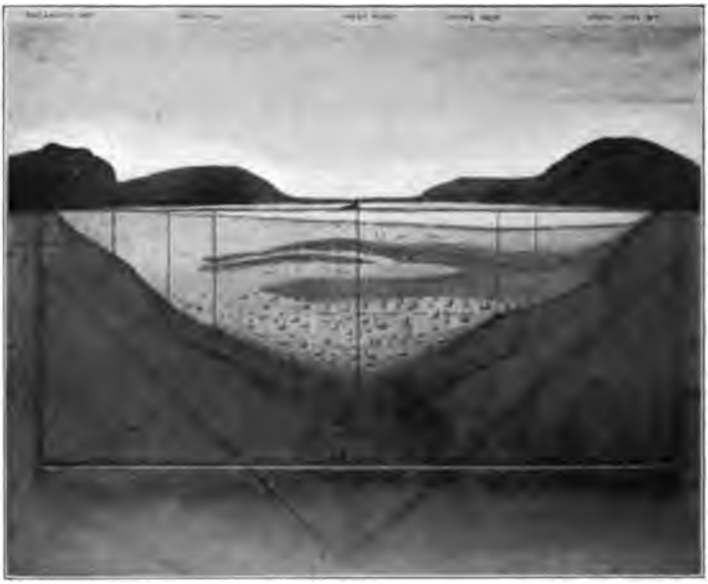
*A. F. Blake.*

THIS is a time of great progress in the field of engineering So many great undertakings are now under way that no one of them receives the attention and recognition that it deserves. The Panama Canal is nearing completion and the new Grand Central Terminal in New York City has been opened to the public. Scarcely less remarkable than either of these great feats of engineering is the construction of the new Catskill aqueduct, the largest in the world, with its deep siphon tunnel under the Hudson River.

New York's present water supply is inadequate for its rapidly increasing population. When we realize that this city adds to itself each year a population as great as that of New Haven, we understand that some big and comprehensive scheme, which will provide for this growth for many years to come, is imperative. To do this the city is constructing a great aqueduct, 127 miles long, which will make possible the development of the watersheds of the Esopus, Rondout, Schoharie and Catskill creeks. At present only the Esopus watershed is being developed, but this alone will be able to supply New York with 250,000,000 gallons of water daily. The new aqueduct runs from the Ashokan reservoir south along the west side of the Hudson River, twisting and bending to avoid obstructions, piercing through hills, passing under deep valleys, till it reaches Cornwall. Here it passes under the river through the deepest siphon tunnel in the world, imbedded in solid rock eleven hundred feet deep. It also passes under the Bronx and East Rivers, is interrupted by two or three other huge reservoirs, and reaches New York where it supplies the boroughs of Manhattan, Bronx, Brooklyn, Queens and Richmond with the water from the foot of the Catskills. Let us start at the upper end and follow it to its final destination.

The water from the Esopus watershed is to be collected in the Ashokan reservoir. This huge basin, which will hold 130,000,000,000 gallons of water, enough to flood all Manhattan to the

window sills of the third story, is being formed by the Beaver Kill dikes and the Olive Bridge dam. This dam is not as large as the one forming the Kensico reservoir further south, but is nevertheless an immense barrier of massive masonry, rising 210 feet above the bed of Esopus Creek. The reservoir, with its shore line of forty miles, will submerge seven villages and thirty-five cemeteries. The dead are not forgotten, however, for the 2,800 bodies are being exhumed and moved to more suitable bury-



CROSS-SECTION HUDSON RIVER AT STORM KING SYPHON.

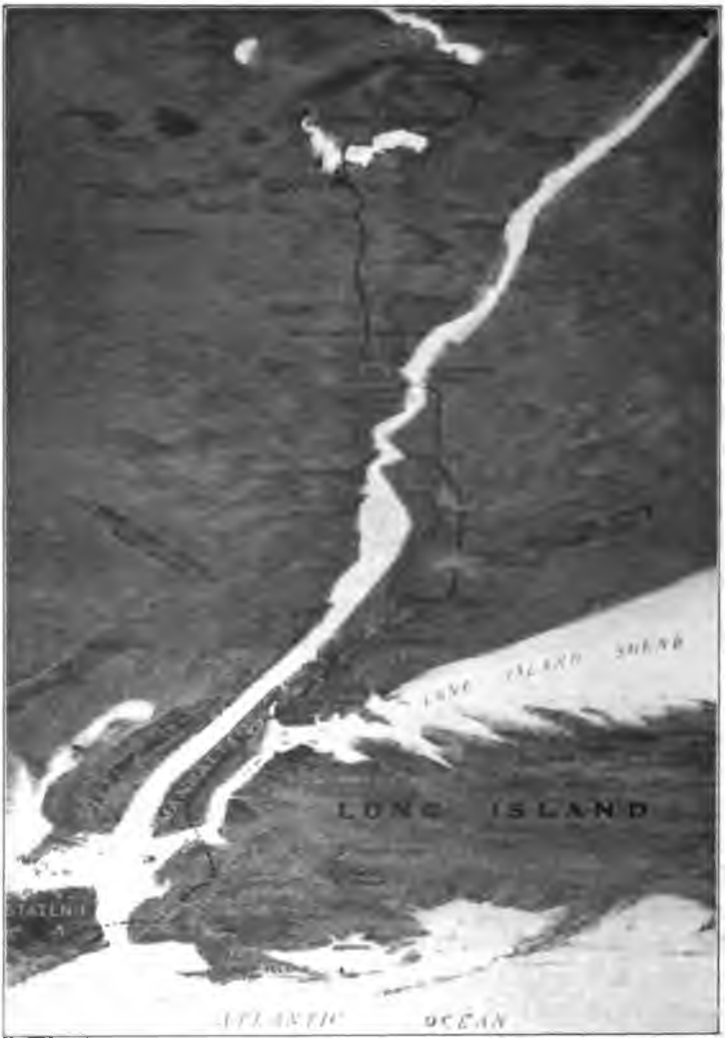
*Courtesy The Engineering Magazine.*

ing places. The aqueduct winds south from the Ashokan reservoir, circumventing hills and mountains, whenever practicable, but at other places piercing through them. There are twenty-four of these tunnels in all, making a total length of fourteen miles. They are horseshoe shaped, seventeen feet high and thirteen feet four inches wide, and are smoothly lined with concrete. The valleys furnish another difficulty. If there is suitable rock beneath them, pressure tunnels are driven through

this rock. These pressure tunnels, seven in number, are all fourteen feet in diameter and are also lined with concrete. When there is not solid rock under the valleys, steel pipe syphons are employed. These steel pipes, strongly riveted, are lined with cement mortar, imbedded in concrete and banked over with earth. Most of the aqueduct is of the so-called cut-and-cover type. It is horseshoe shape, seventeen feet high, made of concrete, and covered by an earth embankment.

When the aqueduct reaches Cornwall, a few miles above West Point, it passes under the river through the deepest spyhon tunnel in existence. This tunnel has been classed by well known authorities as the second greatest engineering project ever undertaken. It extends from Storm King on the west, to Breakneck mountain on the east. It is shaped like an enormous letter U, the legs of which are each as long as two sky-scrapers placed one on top of the other, and the cross-piece equal in length to ten city blocks. The water pressure at the bottom will be 94,260 pounds per square foot. Water exerting such a pressure as this is not easy to keep under control, but the able engineers in charge of the work have studied the matter thoroughly so that there is now no possibility of failure. The tunnel is buried far enough under solid rock so that the weight of the rock above it equals the pressure of the water. To fulfill this condition, it was necessary to go down 1,100 feet.

It was a difficult proposition to determine the conditions deep down under the river. The method by which it was done merits description. The investigation was made by long borings with costly diamond drills. Unfortunately there is no solid rock at this place for a depth of over 700 feet, and vertical borings were unsuccessful in finding ledge rock. The work was therefore attacked from the sides of the river. Two pairs of inclined borings were driven from both sides, which intersected each other in solid rock at depths of 960 feet and 1500 feet respectively. By this experiment, the proper depth for the tunnel, 1,100 feet, was determined. The tunnel headings have now met under the river with a precision which is gratifying to the engineers who have the matter in charge. The walls must now be lined with concrete, as the rough edges would obstruct the flow and cave-ins




CATSKILL WATERSHEDS AND ROUTE OF AQUEDUCT.

*Courtesy The Engineering Magazine.*

might clog up the tunnel. This is done with collapsible steel forms. The finished tube will be a smooth finished cylinder fourteen feet in diameter.

After passing under the Hudson River, the aqueduct goes down the east side of the river and pours its water into the Kensico reservoir, near Valhalla, N. Y., at the corner of the State of Connecticut. This is an emergency storage reservoir to prevent interruption of the supply in case the aqueduct should ever need inspection or repairing. This reservoir will store 40,000,000,000 gallons, enough to supply New York for seventy-five days. The dam which forms the Kensico reservoir is the largest in the world, containing over 1,000,000 cubic yards of masonry. The dam which forms the Kensico reservoir is the the Hill View reservoir, which will hold 900,000,000 gallons. This reservoir, in addition to furnishing a reserve supply for emergencies, will equalize the variations in the use of water from hour to hour, the flow through the aqueduct being constant and steady all of the time.

The cost of this unparalleled water supply system is necessarily enormous. The estimated cost is about $175,000,000. The best engineering brains in the country have been assembled to put this project through. The engineering staff numbers about a thousand men. They have studied the problem thoroughly and have accomplished a work that is without precedent. Especial credit is due to Mr. J. Waldo Smith, who has general charge of the entire project.

# ELECTRICITY AND THE PANAMA CANAL

*E. C. Hunter.*

THE part that electricity plays and will play in the construction and the operation of the Panama Canal is not comprehended by the average layman. What is readily understood, however, is the fact that the waters of the Pacific and the Atlantic must be brought to a constant level, and the means decided upon was the use of locks. Obviously enough, these locks must be operated, and it is electricity that must do it. But let us first consider how electricity is brought to bear on the construction of the canal itself.

At Gatun, a town but seven miles inland from the Atlantic, is one of the two most significant dams, and also one of the most important sets of locks. In the construction of the dam, two miniature mountain chains were built of carefully selected rock, brought in from the great cut at Culebra, by electric railways. The space between these two lines of rock piles was filled in with a natural mixture of sand and clay, pumped in by hydraulic dredges from the lake channel and the channel below the dam. In the pipe lines, some of which were of considerable length, were installed relay pumping outfits; the centrifugal dredging pumps being driven by 550 horse power, 3 phase, 25 cycle, 2,200 volt squirrel cage induction motors.

This dam, thus formed, is 75,000 feet long, measured at the top; is over 2,100 feet wide at the base, and has an 85-foot elevator. When entirely completed it will contain about 21,000,000 cubic yards of material. For the concrete work in the locks at Gatun, crushed stone is obtained from the quarries and crusher at Porto Bello, about 20 miles east of Colon, and the sand from the sand pits at Nombre de Dios, about 15 miles beyond Porto Bello. All cement comes from this country and is loaded into barges and hauled up the old French Canal to a cement shed. This shed is located alongside the harbor and overhangs the channel, so that the cement can be unloaded by a traveling crane. The stone and sand, on the other hand, are unloaded by cable

ways and placed on stock piles near the cement shed. From this cement shed and the stock piles, the raw material is transported to the concrete and mixing plant by a three-phase electric, automatic railway. The cars used on this railway are of the two compartment, double truck, dump type, each driven by two 75 horse-power, 3 phase, 25 cycle, totally enclosed squirrel cage motors. These cars run without carrying attendants, such men controlling the cars while located at the various valves and hoppers. In starting on a cycle, one of these empty electric cars enters the tunnel under the cement storehouse, and is there

THREE-PHASE, INDUCTION-MOTOR-DRIVEN DUMP CARS.

stopped by an attendant, beneath a cement valve, where a measured quantity of cement is discharged into the car. It is then started and runs through the tunnel, extending between the sand and stone stock piles. Another attendant brings it to a stop under valves in the bottom of each of these piles, and the compartments of the car are then filled with sand or crushed stone. When these cars are properly filled, they contain the exact proportions for a charge for one of the two-yard mixers. The loaded car travels up an incline to the hopper of the mixing shed, where the contents are discharged and the car then started on a similar cycle.

From the mixing plant, the concrete is handled by means of a third-rail, direct current, industrial railway. The concrete is discharged from the mixer into buckets set on flat cars. These cars are hauled to the desired points along the lock site, beneath a second set of cable ways spanning the lock excavation, that transport the dump buckets to any point in the lock structure. All the hoisting, trolleying, and tower moving equipment in these cableways is driven by 500 volt, direct current crane motors. The control is of the unit switch type, and the operators are located in the towers at points where they can see the various

CHAMBER CRANES IN OPERATION AT PEDRO MIGUEL LOCKS.

signalmen. Approximately 2,000 cubic yards of concrete are handled by the construction plant in a day, and to complete the Gatun locks 2,250,000 barrels of cement will be needed.

All this construction work has been carried on on the east Atlantic side of Culebra cut. Local conditions on the Pacific division are so totally different that the whole method of construction has to be carried on accordingly. The one flight lock at Pedro Miguel, which connects with the Miraflores Lake, is inconsiderable in comparison with the larger locks at Miraflores. It is only natural, therefore, that calculations for the construction of the two dams were based wholly on economy for the latter.

Even at this rate, construction is carried on more cheaply at Pedro Miguel than at Gatun. The crushed rock used in the concrete at Pedro Miguel and Miraflores is obtained from the quarries and crushing plant at Ancon Hill and is hauled down grade by rail. Sand pits about twenty miles west from the entrance of the canal, furnish the sand, which is transported to the docks at Balboa and unloaded by electrically operated sand cranes. Electricity here again proves itself efficient and economical.

At Miraflores, four cranes, called chamber cranes, operate in the lock chambers, and two chambers on each side of the lock site operate on top of the side banks or beams of the lock-pit and are called berm cranes. The fixed cantilever of the berm cranes extends over the stock piles and handles the stone dry grab buckets to the hoppers of the mixing plant, which is located in the lower part of the crane tower. The concrete is then discharged into dump buckets set on a platform on the opposite side of the tower, picked up by the hoist and trolley on the hinged boom, and either deposited in the lock side walls or transferred to the chamber cranes, to be placed at any point in the center wall. Cement is delivered direct from the cars to a platform above the measuring hoppers, the cranes being operated by direct current motors.

One of the most interesting phases of the Panama Canal is the electrical operation of the gates. Before taking this up, however, it might be well to briefly mention a few general facts about the locks themselves to give a clearer understanding of the gate mechanism. All the locks are built in pairs, so that if any lock is out of service, navigation will not be interrupted; and when all of the locks are in use, passing of shipping will be expedited by using one side of the locks for ascent and one for descent. Each lock will be a chamber with walls and floors of concrete, and metering gates at each end. There is a double pair of gates at each end of each of the locks, and at one end of Pedro Miguel lock is an additional pair of guard gates. This double gating is for the sake of safety; to permit of repairs being made to one pair of gates while the other pair is being made use of, and to give added insurance against some mishap which might otherwise

put one side of the lock out of commission. To protect the gates against vessels crashing into them, fender chains are stretched across the lock walls which are so controlled as to be able to check a ship of 10,000 tons capacity, moving at the rate of five miles per hour, within 70 feet.

In the operating mechanism for opening and closing the lock gates, it might well be noted that motion is imparted to the lock leaf by a horizontal strut, connected by a vertical pin to the upper girder of the gate leaf. A crank pin, attached to a large gear wheel, fits the other end of the strut. A 50 horse-power motor turns this gear wheel through a pinion. The water on the main culverts is controlled by a valve which regulates the emptying and filling of the locks. The upper end of the valve stem is carried by a crosshead, actuated by two vertical, revolving, non-rising screws, driven by a 50 horse-power, 3 phase, 25 cycle, 220 volt induction motor, through a friction clutch and reducing gear. The motor is arranged for either local or remote control, and auxiliary hand aparatus is also provided for closing the gate, should it be ever necessary to do so, without using the motor.

There is a rule stating that no ships may pass through any locks under their own steam, on account of the damage which might result from it. A ship will come to a full stop between the approach walls of one flight of locks, where four electric towing locomotives, operating on the lock walls, will make fast to the ship by means of hawsers. Two of the locomotives will pull from the bow, and two will be towed by the rear, to steady the ship. These engines will remain with the ship until the vessel is delivered clear of the locks.

Two tracks, one for towing and one for return, will be used. On the center wall there will be two towing tracks, with one return track between them, and on each side wall, a towing and a return track. The motors of these locomotives are of the high torque induction type, 3 phase, 25 cycle, 220 volt, and totally enclosed. They will be operated in parallel and controlled by resistance in the secondary circuit. Current will be supplied by means of a plow carrying two contact shoes, each operating on a separate contact rail in an open conduit for each of two phases,

while the third phase will be carried by both track rails. The tractor motors are 75 horse-power each.

The last thing to be taken up, and electrically the most important, is the power supply. Two steam turbine plants, a temporary one at Gatun and a permanent one at Miraflores, furnish all the power. The latter plant will be held as a reserve to the hydro-electric plant to be built at Gatun.

In each of these stations there are installed three 1500 K. V. A. 3 phase, 25 cycle, 2200 volt turbo-alternators; the 500 volt direct current for cranes, cable ways, etc., is obtained from rotary convertors. The Gatun electric plant will supply current for the electric driven lock gates. The reserve plant at Miraflores will be connected to the transmission line which is to be constructed across the Isthmus. This will give the equipment resources from either or both of these points. This makes the electric system infallible.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## THE DISCOVERY AND NATURE OF RADIOACTIVITY

*H. H. McHenry.*

RADIOACTIVITY was first discovered in 1896 by Becquerel, who was led to suspect that it existed by Röntgen's X-rays. Becquerel wrapped a photgraphic plate in black paper, and placed on it a piece of phosphorescent uranium. The picture darkened even through the metal plate, leaving a distinct image. Later he repeated the experiment in a dark room, and finding it succeeded equally well, he judged that neither light nor phosphorescence was the cause of the darkening. It must, then, have come from an inherent property of the uranium.

Several years later Mme. Curie tested different elements for radioactivity and found only two to possess it, namely; thorium and uranium. She also found that certain minerals containing uranium, notably pitchblende (over 50% uranium oxide), a mineral found in Austria, are much more radioactive than can be accounted for by the uranium present. Some pitchblendes are from three to four times as radioactive as uranium oxide, which can only be accounted for by the presence of one or more elements more radioactive than uranium. Mme Curie found that the elements bismuth and barium are present in pitchblende in small quatities, and while not radioactive in themselves, were found to be so when separated from the ore. This was caused by a new element being united with them.

Upon analysis, Mme. Curie succeeded in making a partial separation of these new elements. She called the one united with the bismuth, polonium, after her own country, and the one with the barium, radium. The radium she found to possess a quantity of energy hitherto unknown.

Some idea of this enormous amount of energy can be gained by the fact that altho only one part of radium is present in 5,000,000 parts of the best pitchblende, it is a million times as radioactive as this amount of the mineral. The total amount of radium ever extracted is only a half an ounce, and pure radium has never been separated, the nearest to it being the separation of the ore into radium-chloride, which was done by Mme. Curie.

If half a grain of radium-bromide were divided equally among every person in the world, each would have enough to be easily identified by a gold-leaf electroscope. In the laboratory of Physical Chemistry, it is found that a quantity of one-three-thousand-millionth of a gram is easily recognizable. These facts show what a tremendous amount of energy is secreted in a small particle of radium.

One way this energy is manifested is by the thermal effects. If some radium is kept in a leaden vessel, the surrounding walls absorb rays which raise the temperature of the wells. Experiments show that half a grain of radium gives out three calories of heat per hour. This is sufficient to raise the temperature of an equal weight of water in an hour from freezing to boiling. Considering the fact that an equal weight of coal would only evolve 250 calories during *complete* combustion, and that the supply of energy from carbon is the greatest of any element in commercial use, one can obtain some idea of the vast amount of energy in even a small quantity of radium.

An interesting experiment illustrating this seemingly endless supply of energy, is the spinthariscope, an instrument devised by Sir William Croakes. It consists of a freely swinging needle, allowed to touch a phial which once contained a particle of radium, and mounted in a brass tube. At the bottom of this tube is a screen coated with zinc-sulphide. A lens, for magnification, is placed above. Observed through the lens in a dark room, a fluorescence is seen, not continuous, but discontinuous like a planetary nebula, or shooting star. Later, the scintillations become replaced by a steady luminous light. The scintillations seen are the energetic alpha-particles, of which we will speak later. By observing these scintillations it has been found that a trillion alpha-particles are expelled per second.

The significant fact is that the spinthariscope will keep on working for countless generations with an apparently undiminished supply of energy, although the parts may wear out and have to be replaced. It is for this reason that radium is such an unusual substance, as other radioactive substances, such as palonium, lose their radioactivity, the disintegration becoming soon complete.

It is wonderful to think what may be accomplished along mechanical lines when we learn how to utilize this vast store of energy. Fuel will become a thing of the past, and engines will be run entirely by radium. In fact, we may imagine all our power for steamships, trains and factories, furnished by radium, when man learns how to harness this useful element. The engines will also be much more efficient than they are now, as the entropy will be greatly decreased. This, however, is a matter too technical to be taken up here.

From the discovery of radium, scientists have been led to believe that some of the heavier elements, such as uranium, may be slowly disintegrating to form lighter elements. If this is true, the whole foundation of our modern chemical science will be overthrown, as the present theory postulates that the atom of an element is the ultimate particle into which it can be divided, and still retain its characteristic properties. Therefore, if these heavy elements disintegrate and form lighter ones, they are not "elements" in the sense we understand them to be. This, however, is a matter of considerable speculation, and may not be fully understood for some time to come.

In order to comprehend the nature of radioactivity, its effects must first be known. At present there are four known effects. Firstly, the effect it has on a photographic plate, similar to light and other agencies, which effect we have already referred to. Secondly, radioactive substances excite phosphorescence in certain substances in their neighborhood. Thirdly, a radioactive body causes air and other gases to lose their insulating power, and to become partial conductors. Because of this, the presence of a radioactive body can be shown by the deviation of the leaves of a gold-leaf electroscope. Fourthly, as we have already seen, radioactive bodies generate heat, though only the

more powerfully radioactive substances, such as radium, exhibit visible heat, or phosphorescent effects. Radioactive bodies have been handled unknowingly by men for centuries.

Now what is the cause and direct manifestation of this energy which we have seen radium to possess? The explanation lies in the peculiar phenomena known as "rays", which are emitted from a particle of radium. These rays are classified into three types, the alpha, beta and gamma rays, according to their power of penetrating matter. The kind of matter which they pass through has no effect on their power of penetrating. The beta-rays have a penetrability a hundred times as great as the alpha-rays, and the gamma-rays in turn a hundred times greater than the beta-rays. The energy, however, of the alpha-particle is much greater than that of the other two rays put together. The exact reason for this is not fully understood, although it may be due to the fact that the energy of the alpha-particle is of a quantitative nature, while the energy of the beta and gamma particles is of an intensive nature. The comparison test from which these results are obtained is made with the electroscope. Radioactivity is a mass or volume phenomenon, and the rays are not emitted from the surface alone, but from the interior as well.

Now what do the rays consist of? They are not ether vibrations like light, but are more like X-rays, which are produced by forcing an electric current through a nearly vacuous space, a thing which it prefers not to do. Rutherford has shown that the alpha and beta-rays consist of minute corpuscles propagated from the body at tremendous velocilties. Newton thought that this was the case with light, and at that time he was upheld by a great many people. Later this hypothesis gave way to the present theory of ether vibrations.

The electrical effects on the rays is a very important feature. The trajectories of the rays are strongly deflected by a magnet, most notably in the case of the beta-rays, which are also analagous to electricity in many other ways. In fact Soddy holds the opinion that the beta-particle is in itself a negative electric charge. For one reason the beta-particle is very similar to the Cathode ray, except that its speed is much greater, approaching that of light itself. While the alpha-particle is deflected magnetically,

the effect is only a hundredth as great as the effect on the beta-particle, and in the opposite direction. This indicates that it contains a positive charge, and that the alpha-particle is not a disembodied charge, but a charged material particle.

There are many properties peculiar to radium, which other radioactive bodies do not possess. Among them is the absence of the beta-ray in polonium, and the fact that X-rays are not deflected at all in a magnetic field. There is also the emanation, a peculiar radioactive gas given off by radium, but time and space will not permit the subject being treated here at any greater extent.

* *

## SCIENTIFIC DRY FARMING

W. W. Mills.

FOREMOST among countries in agricultural resources, equipment and production, the farming element of the people of the United States has laid broader, deeper and more substantial the foundations of a magnificent agriculture. Here we have a country covering the breadth of the North American continent and extending almost to the arctic regions on the north, and to the semi-tropical regions on the south, with a total area of 3,692,125 square miles, of which in 1900, 838,591,774 acres were in farms and 414,498,487 acres were under cultivation. Moreover, within this great area we have all the variations of soil, moisture, altitude, heat and rainfall, and all other agricultural conditions so numerous and so considerable in degree that the productions of agriculture are of such great varieties that the world's market is largely affected by many of them.

Great and rapid development has characterized the agriculture of this country, and it is difficult to imagine more extensive changes than those that have occurred in the agricultural industry from the middle of the last century to the present time. One problem, however, remained, and that was the reclamation of the

west, where there were millions of acres of good soil, but without sufficient rainfall to make farming a paying proposition. On June 17, 1902, President Roosevelt signed the bill known as the Reclamation Law, setting aside the proceeds from the disposal of public lands in some western states and territories for the construction of irrigation works. Although these irrigation works have aided the western part of the country very much, nevertheless, the problem still remained to be solved, as to how to get crops from the high mountainous parts, where the precipitation was annually only from five to twenty inches, and most of this falling not throughout the year, but during that period known as the rainy season. The main states and territories included in this are, Wyoming, Utah, New Mexico, Colorado, Montana, Arizona, and large areas of California and Idaho. In New Mexico, especially, the problems of reclamation are very difficult, owing to the character of the water supply and the large extent of the old Spanish land grants, taking up much of the best land of the territory. The principal streams are the Rio Grande and the Pecos, and in order that their waters may be successfully stored, the problems of silt must be solved, which up to the present time has not been profitably done. So in many of the states, and New Mexico especially, some artificial means must be found to store the rainfall, since the storing of the waters is impracticable.

The chief and perhaps the best known method of storing the rainfall is the "Campbell Dry Farming" method, which is here briefly outlined.

In the early spring, just after the winter snows have melted, and the ground is just dry and hard enough so as not to stick to a plow, the "disk harrow" is used, and its great value in dry farming "lies in its adaptability to the protection of moisture, the preparation of the surface soil for the encouragement of rapid percolation of the rain water, in thoroughly pulverizing a somewhat cloddy plowed field and in getting an improved physical or mechanical condition of the soil". The disk harrow simply pulverizes and loosens the surface, for a double purpose; first, to break the hard surface, so as to allow a more rapid soaking of rainfall into the dry soil below, as well as to break up and form a soil mulch which will prevent the loss by evaporation of the

precious moisture. In addition to storing the water, the harrowing of the fields gives ready admission to the air, which is most advantageous, first in warming the soil, and second in promoting a more rapid chemical action, which is necessary to the development of fertility. As soon as the crop is harvested, the disk harrow is again used so as not to allow the soil to be exposed longer than necessary to the sun's rays. This is most important, for there is no time in the year when water is held in the soil near the surface so as to cause so many chemical changes as in the latter part of July and August. Further, if you do not wish to plow, the moisture will be held until the following spring, so in case of a dry spring, the soil, if properly handled, can be planted and success assured.

Plowing is, of course, one of the most important steps in the preparation of the fields for the best possible results in any crop growing. If the land is in a bad physical condition, it should never be plowed, for the result is almost sure to be a failure. No invariable rule for depth of plowing can be given, but it should be done just to a sufficient depth to stir that part of the soil that will contain the larger part of the feeding roots. For the average prairie soil the plowing should be about seven inches. If new prairie lands are to be broken up, the plowing should be done the fall before, and to about the same depth as above.

The next step in dry farming is the sub-surface packing. By this we mean the packing of the soil at the bottom of the ordinary furrow by a mechanical process and the elimination of the open spaces between the large lumps of earth. It is not compacting the surface layer as is done by a roller, for that would simply mean a waste of the land as dust. The main object of the sub-surface packer is not so much to aid the storing of moisture in the soil, but to control or equalize the holding capacity of the soil for both air and water. If the soil is too coarse and loose, then the air exists in too large quanties, and the development of nitrates and bacteria is proportionately slow. Of course the storing of moisture is an important function of the packer in order to carry the crops through any drought that might occur. Upon this lies the whole principal of dry farming. Another advantage of the packer is, to quote from a report of the Secretary

of Agriculture, "It is able to keep up the supply of moisture about the roots to that degree, that nitrification and the development of fertility continues, though the weather be hot and parching, and the plant is growing rapidly, and yet through this ideal condition we are able to keep up the supply of plant elements in a soluble condition, thus giving to the plant that dark green, healthy, prolific growth without a setback, which is the secret of large yields."

This method of storing the moisture and air in proper amounts, even if there is very little rainfall, and in preparing the ground carefully, may be said to be revolutionizing farming, and will soon make our "Great American Desert" an oasis in our country.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

THE YALE SCIENTIFIC MONTHLY wishes to acknowledge the receipt of the following books, which will be reviewed at the earliest opportunity:

*Genetics.* By H. E. Walter. The Macmillan Co. $1.50 net.

*Household Bacteriology.* By Buchanan and Buchanan. $2.25 net.

*Review Questions and Problems in Chemistry.* By M. S. H. Unger. Price, 50 cents. Ginn & Co.

---

*Heredity and Eugenics.* By William E. Castle, John M. Coulter, Charles B. Davenport, Edward M. East, and William L. Tower. University of Chicago Press. 1912. pp. i-vi, 1-315, with 98 text figs. Price, $2.50 net.

This book contains in final form a course of lectures summarizing recent advances in knowledge in variation, heredity, and evolution, and their relation to plant, animal, and human improvement and welfare. Chapters I and II are contributed by Professor Coulter, the former being of an introductory character and discussing the recent developments of heredity and evolution, and the latter treating of the physical basis of heredity and evolution from the cytological standpoint. The conception of evolution, both organic and inorganic, is as old as our record of man's thought; therefore no one is responsible for it, as many suppose Darwin to be. It is the common property of the human race. A sharp distinction is made, however, between the speculative stage of evolution, which is imaginative and philosophical, a .d the observational stage, which has established evolution as a f. ct.

There are seven categories of facts which have proven evolution, of which the principal ones are the observed intergradations of species; their adaptability; the presence of "rudimentary", properly vestigial, or abandoned structures; and the great life panorama of the geological record which "was historical evidence of tremendous weight in favor of the fact of a gradual organic evolution". Furthermore, the facts of embryology and finally those of the changes wrought upon plants and animals by domestication, which, while unconsciously performed, Darwin called "an experiment on a gigantic scale", all serve as added proofs of the doctrine.

But acceptance of evolution as a *fact* and explanation of it as a *process* are to be kept clearly distinct, for the failure to distinguish between them has led to much confusion in popular statement and belief. Some of the dominating explanations of evolution, such as the influence of environment, of use and disuse, of natural selection, of mutation and orthogenesis, are discussed by Professor Coulter. Biometry, heredity and their practical applications close the chapter. Chapter II is an elaborate discussion of cell structure and activity and their influence on heredity.

In Chapter III, Professor Castle discusses the method of evolution, emphasizing especially the truths taught by the Mendelian law as applied to the breeding of guinea pigs and hooded rats; while in Chapter IV, heredity and sex are treated, and the conviction is stated that if the determination of sex depends upon the inheritance of a Mendelian factor differentiating the sexes, it is highly improbable that the breeder will ever be able to control sex. Only in parthenogenesis (the suppression of the male element) can man at will control sex, and until he can produce artificial parthenogenesis in the higher animals he can scarcely hope to control sex in such animals.

Professor East in Chapter V sets forth our knowledge of inheritance in the higher plants, which again is a discussion of the Mendelian factors. The application of biological principles to plant breeding is interesting in the economies of time which the new ideas in the field of selective breeding bring about. "To the belief that faith and continuous selection toward an ideal would

produce any desired result has succeeded the idea that nature alone produces variations and that man's duty is to be alert to grasp their possibilities and make the most of them. No longer is it believed that many generations of work are necessary to purify a commercial variety of plants from undesirable characters. No longer is there belief that the results of selection are continuous, that it gradually perfects a character. We work for strains homozygous for characters that we know are there, and, by our direct methods, we get them without loss of time."

Professor Tower, in Chapter VII, shows the recent advances and the present state of knowledge concerning the modification of the germinal constitution of organisms by experimental processes. "It has been proved that variations do arise primarily in the germinal substance, and appear secondarily in the soma; but can it be proved that modifications arising in the soma are transmitted to and incorporated into the germinal constitution and appear in subsequent generations? It is apparent that properly planned and conducted experiments are alone of service in the attempt to solve this question." Present experimental evidence, where critical, clearly indicates the increasing doubtfulness of the validity of the hypothesis of somatic transmission. It has been suggested that germinal variations arise by five main methods: through the direct action of external forces, through selection, hybridization, amphimixis, and through the operation of orthogenesis. The idea of sudden transmutation in the germinal material is explained by the use of De Vries' classic primroses, as well as by its application to certain beetles; and the experimental production of germinal variations by direct action of different forces is set forth, such as the injection of chemicals or the rays of radium, and by hybridization, combined selective concentration and hybridization, and selection. In summarizing, Castle says:

"It is evident that the problem of germinal change is one of difficulty, and involves more of indirect than of direct methods of investigation. There is little reason to expect that present biochemical methods can give a solution, but they may give valuable suggestions for further indirect investigation. It seems not improbable, however, that this problem, like so many others in

biology, must await the solution of the larger question of what life is before it will be possible to express in exact terms the nature of germinal changes."

In Doctor Davenport's section, the humanistic application of the problems is the theme. Chapter VIII treats of the inheritance of physical and mental traits of man and its application to eugenics, in which great advance has been made in recent years in the analysis of traits. "At last it is possible to give definite advice to those about to marry, or who do not wish to transmit their undesirable traits. Of the method of inheritance of many traits we are still in ignorance, but in the absence of detailed knowledge, the best general advice is this: marry dissimilars. Weakness in any trait should marry strength in that trait; and strength may marry weakness."

Chapter IX discusses the geography of man in relation to eugenics under several subdivisions, such as the relations of barriers to human breeding, migrations and their eugenic significance, the influence of the single germ plasm on the race, and the eugenics movement. The closing paragraph speaks of the establishment at Cold Spring Harbor, Long Island, in October, 1910, of the Eugenics Record Office, which "seeks to be a clearing house for data on human blood lines in America. It has collected several hundred records of family traits and made extensive studies into the pedigrees of the feeble-minded, epileptic, paupers, and insane. * * * In time we shall have there, we expect, data that will be useful to those contemplating marriage. In various directions we hope to play an important part in creating a sentiment and a knowledge that shall lead to the improvement of the blood of the American people."

RICHARD SWANN LULL.

*College Zoology.* By Robert W. Hegner. The Macmillan Co. 1912. xxiv. 733 pp.

In 1910 Professor Hegner published an "Introduction to Zoology." In this book only the most important invertebrate types were considered, not only from a morphological standpoint, but as well from one in which physiology, ecology and behavior were

co-ordinated. Considerable portions of this book with additions, such as consideration of Phyla not there taken up, and omissions have been incorporated in the present work, and make up more than half of it; to this has been added a description of the Chordata.

To compress so much into one volume in which the physiology of animals as well as their structure shall be considered, has necessitated a condensing of material which hardly warrants the attempt. The general account of the type species in the book before us are much too short to be of any very great value; and animal physiology has been discussed only in so far as the description of the behavior of animals—their responses to various forms of simple stimuli—are concerned. How such responses are carried out, their mechanism, and how they have been derived at and developed is not considered.

Relatively too much space has been devoted to classification and to a review of the orders. The number of pages devoted to these subjects being, in several instances, entirely out of proportion to the few pages in which the anatomy and physiology of the type species are described.

In its treatment of the various phyla the book reminds one of Parker and Haswell's "Text-book of Zoology", and of other recent text-books, from which indeed most of the subject matter has been obtained. Few of the figures are original, but they are very good and clear. Errors are scarce and the work has evidently been carefully compiled. A comparative anatomy, however, in one volume is a difficult thing to produce, and the author has not succeeded over well.

HENRY LAURENS,
*Instructor in Biology.*

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'78—Charles S. Churchill is chief engineer for the Norfolk & Western Railroad. He is also president of the American Society of Railroad Engineers. His home is at Roanoke, Va.

'83—A. Felton Wood died in West Haven, Jan. 10, at the age of 51. The old homestead in which he lived was famous as a historical landmark, and was built in 1697. He left a prosperous drug business in New Haven, with a branch in West Haven.

'03—Charles R. Bostwick is now located in Plainfield, N. J., as supervising instructor of manual training in the local high school.

'08—Paul S. Gates is now representing the Marlin Fire Arms Co., of New Haven, in the west.

APRIL, 1913

# The Yale Scientific Monthly

VOL. XIX — No. 8

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. APRIL, 1913. No. 8

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. APRIL, 1913. No. 8

## EDITOR'S NOTES.

### A REVIEW OF THE MONTHLY

A HIGH wind was blowing from the East. It bullied me at the corner, hissing the tale of its work in the West. I had beaten up Grove with a newspaper, trying to glimpse something of Ohio's floods. The wind tore the paper out of my hand. "Learn of me!" it whistled.

I gave it up, and burrowed into Byers basement. Stealthily the stolen passkey slipped into the door of the SCIENTIFIC MONTHLY's sanctum. I slipped within the room no less stealthily, and sat in the editor's chair.

It was night. The Hall was deserted. Above my head they stood, a comfortable but not crowded shelf, eighteen volumes of the MONTHLY, and a dozen thin issues soon to make Vol. XIX. A sturdy set of books they were, well bound, too, and decorously close together, something too orderly for the treasures of a sanctum.

"How does it feel to be an editor of the MONTHLY?" I asked them. "Is the SCIENTIFIC MONTHLY needed?"

The editors replied, almost feverishly, from their shiny leaves.

"If Academic is able to support four publications," pleaded 1908, "surely Sheff, now almost her equal in number, will stand back of one." The tone was wistful.

Nineteen-eleven was vociferous.

"We feel that there is not only a place, but an absolute necessity, a crying need, for such a magazine."

Nineteen-twelve nooded assent.

"There is a positive necessity for such an organ."

They all said it a little uncertainly, I thought, just the same.

A need? Yes, but for what? I could not help asking the question. I could not answer it, as I faced the eighteen volumes, and the nineteenth, and I thought of the twentieth to come. I was only an interloper in the editor's chair, after all.

I turned the leaves of Volume Nineteen. The editorials, I thought, had grown fast, earnest and well-meant, as always, perhaps losing a little grace in the effort.

The articles seemed about the same, with a somewhat larger number on Yale topics, and fewer from the Faculty. H. D. S. and F. W. S. signed a number of scientific notes of merit. But there seemed no one writer who measured up to Lindell Bates or Washington Platt in former years, no writer with any real power behind his pen; and I could not help thinking of the men in Sheff who didn't write but whose work I knew in other ways, men with much journalistic power. Many MONTHLY articles had scarcely more than the passing interest of a note from Popular Mechanics. The contrast between the tone of editorials, where interest was high, and the general average of articles which made the body of the magaine, struck one like cold water in the midriff.

I thought, then, I knew why the editors of the past years had been so anxious in their tone. They felt sure of an audience for the voice of Sheff speaking through them. They were not sure of support for the rest of the volume.

There were some articles, it is true, which held me longer than others. The Yale Work number in November had some good material, which deserved more skillful featuring. Historical articles on Yale, scattered through the numbers, would have filled another good Yale number. Perhaps one solution might come,

from making each number a unit, going for one big thing, and getting it. I began to plan some numbers, but my brains went a-blackberrying.

Who will blame the 1913 Board for not solving a problem their predecessors have not answered? In Bates' year, it seemed, longer and more earnest articles were secured, and a way out seemed likely. That was in 1910. Then the MONTHLY slid back again into its old groove.

Is there a way out? I believe there is. I am sure I do not know what way, but the way will be found some time. Perhaps, when that day comes, the editors will cease to tell us of the great need for their work. It is for them to find it. An interloper, sitting for a casual moment in the editor's chair cannot help them.

I turned over the leaves again. Am I a crank about punctuation, or is the MONTHLY perpetuating a tradition of carelesseness in editorial matters? Once in the old days the editors closed a long and earnest article by Professor Keller on "Science and the Humanities" with a few lame paragraphs recommending the Northfield Conference. There is nothing so funny this year, only lack of the sense of editorial responsibility. May this tradition of the MONTHLY pass with the year, and editorial honor be redeemed.

I put the volumes back. After all, the MONTHLY was sticking to its guns. It did voice Sheff. Its product was a respectable one. Its Board had manfully faced great difficulties. It must win out; it will find in the future the way to be most truly representative of our great school.

The bell across the street sounded, and I resigned the usurped throne. These notes, scattered upon the desk, I left as a token of sincerest good will and good wishes for the success of the MONTHLY, past and to come.

*H. W. MacCracken.*

* *

## A SHEFF MAN IN THE CORPORATION

THERE is to be an election next June by the alumni to fill the two vacancies in the Corporation of Yale University caused by the resignation of ex-President Taft and the expiration of Mr. Whitney's term of office. A movement has been started to elect a Sheff graduate to fill one of these vacancies. A meeting to organize this campaign was called by a special committee of Sheff graduates and invitations were sent to all the classes, requesting the attendance of all class secretaries and two other members of each of the several classes. This meeting was held at the New York Yale Club on Thursday, March 6. Perry Jackson, '85S, and E. R. Sargent, '80S, were elected chairman and secretary of this meeting, respectively. The meeting adopted the following resolution:

"Resolved, That a committee of Sheff alumni be formed, to consist of the chairman of this meeting and two others, to be chosen by ballot at this meeting, which committee shall select within one week hereafter four additional members, making a committee of seven.

"It shall be the duty of this committee to carefully and impartially consider the qualifications of all candidates from Sheff for the vacancy in the Corporation of Yale University to be filled by election in June next, whose names shall be submitted to it, and it shall have authority to recommend, on or before May 15 next, by a letter to be published in the *Yale Alumni Weekly* and in the *Yale News*, one or more of such candidates as being worthy of the support of all Yale alumni."

The committee chosen at this meeting consists of the chairman, Perry Jackson, '85S, Dr. J. A. Hartwell, '89S, and A. F. Kountze, '91S. These men are to select four more to make up a committee of seven.

It has been felt for a long time, by members of all departments, that Sheff should be represented in the Corporation. This will be the beginning of the equalization of both groups of alumni in the membership of the Corporation.

## CLASS DEACONS AND THE UNDERGRADUATE DISCIPLINE COMMITTEE

THE Sheff Undergraduate Discipline Committee is now composed of the three Senior Class Deacons, the three Junior Class Deacons, and three members chosen from and by the Student Council. This committee holds a very important position in the life of the Scientific School. All complaints regarding the Honor System are made to the members of this committee, and their decision in any case is absolute and final. An undergraduate body which carries the responsibility of the success of the Honor System, and which is endowed with such powers, requires men of peculiar character and ability. It appears that the type of man required on this committee is not necessarily the type of man required to fill a deaconship. May we suggest that the qualifications for the two offices are, or may be, entirely distinct? May not some men whose religious nature fits them peculiarly for a deaconship, lack the peculiar energy, leadership and experience required by a member of the discipline committee, and may not the converse be true?

The class deacons were undoubtedly put upon the discipline committee, at first thought, as being men of fairness and uprightness, and very naturally. Fairness and integrity are essential qualities for a member of the committee, but the point we wish to make is that there are other qualities no less essential to a member of the committee, which do not necessarily belong to the class deacon.

Without the slightest disrespect, we suggest that a change in the election system by which the members of the Discipline Committee would be chosen not as deacons, but in a separate election as members of the Undergraduate Discipline Committee, would lead to two important results. First, the voters would appreciate more fully the exact nature and seriousness of the position to which they are electing the men, and secondly, men would be chosen with abilities peculiarly suited to their position of responsibility upon the committee. If these men are the proper men for the deaconships, let them be elected to those offices in a separate election, and nothing will be lost by the innovation.

## CLASS ELECTIONS

THERE has been much criticism lately regarding the action—or rather, non-action—of the Academic Sophomore Class in regard to their class elections. They have been severely censured several times in the *News* because at some recent elections less than half of their class voted. While the Sheff elections have made a better showing than this, they certainly leave much to be desired. The one time above all others when all undergraduates ought to get together and show a little spirit is at class meetings. It is most important, in order to insure the election of the best men to the various offices and managerships, that as many men as possible should vote. By no other means is it possible to secure men who are representative of their class. It is to be hoped that everyone will profit by the criticism so justly deserved by the Sophomore Class, and make a point of being present at all future elections and class meetings. Every man, unless absolutely prohibited by very important reasons, should consider it his duty to his class to vote at all elections.

* *

## A WORD OF ADVICE

ALREADY the office has posted notices to the effect that one can now file applications for rooms in the various dormitories for next year. It is urged that many commuters take advantage of this and live on the Sheff campus next year, if they can possibly do so.

The advantages of rooming in the dormitories during Junior and Senior year are many. In the first place it helps you to get better acquainted with your classmates, and brings you more in touch with college affairs. By not having to spend several hours a day riding back and forth, you are able to save a great deal of time that can be used very profitably both in connection with your studies and in extra-curriculum activities. In fact it is hard to

see how it is possible for a commuter to participate in any of the outside activities, because he is laboring under such a great handicap from the rest of his class. It is therefore very greatly to your advantage, Commuter, to make a change this next year.

One is astonished, in looking over the catalogue to find so many men living at home, and it is a fact, though perhaps a hard, cruel, one and unpleasant to face, that these same men are, as a rule, scarcely known by the rest of the class outside of their own division. One of the greatest benefits obtained by going to college is the opportunity to make friends, and anything that tends to deprive a man of this chance is directly interfering with one of the chief graces of a college man's life. Consulting the ideas of past classes on this point, as shown by the Senior Statistical Blanks of these classes, we find that the forming of friendships and extra curriculum activities are two of the items that received a great many votes as being one of the greatest benefits of going to Yale.

* *

## AN OPEN "GYM"

KEEPING the Gymnasium closed in the evening prohibits many a Sheff man from getting any use out of it at all. Junior and Senior engineers are kept busy practically every afternoon with classes of some kind or other. It is with the greatest difficulty that Sheff upper classmen can go over for exercise because of the fact that it conflicts with curriculum work. If men who had a desire to make use of the "Gym" were given an opportunity, they could be on an equal footing with Academic in athletic activities. Keeping the "Gym" open until perhaps nine o'clock is the only way to bring about this result. It has often been said that Yale turns out few track athletes of note, merely because her men don't go out for things to find out how good they are. Sheff engineers have no opportunity to find out what they are made of and so cannot do their share to make Yale foremost in College athletics. Why not at least try the plan of holding

the Gymnasium open for the early part of the evening, to see if our upper classmen would not grasp the opportunity, not only to develop themselves, but to do something for Yale.

* *

## CAMPUS CONCERTS

NOW that the spring term is upon us, all of Sheff begins to spend the early evening outdoors. Almost any evening, groups may be seen here and there, talking and smoking with a feeling of perfect conviviality. This is to be encouraged, because it brings Sheff men in closer touch with each other and gives any man joining in them a chance to learn another fellow's ideas, and so broaden his own viewpoint. Now, too, that it has begun to get warm, the fellows do not gather in a room after dinner, as they did, but rather spread around all New Haven, even to Savin Rock. If this is the case, and it surely is, why not have some tangible means to keep men together, and to promote the spirit of comradeship which the Byers Hall smokers have so successfully instituted? Why not have Campus concerts, as last year, only more of them? Last spring many Freshmen held aloof from these concerts because, and the truth must be admitted, they felt ill at ease on the Sheff Campus, with which they were unfamiliar. Juniors and Seniors turned out in large numbers, but of Freshmen there was scarcely a handful. These concerts were founded for the benefit of all Sheff, and all Sheff should take advantage of them. It is attendance that makes any concert a success, and if Sheff wants more of them, let the students support them, for they are what promote the democracy of which Yale is so justly proud.

* *

## THE UNDERGRADUATE

IN an age when the favorite pastime seems to be to criticise the college man, it is gratifying to read such a sympathetic treatment of the problem with which the college professor must deal as appeared in the March issue of *Harper's Magazine.*

Not only is the article valuable on account of its literary merit, but it also carries with it a great deal of weight because of the position of the writer. From the business man, who is often hard to convince, Professor Canby's statements must command respect, for, as an instructor in Yale University, he must know his subject. Yet "The Undergraduate" makes its greatest appeal to the student; and for him, rather than the country as a whole, it was undoubtedly written. After all, the instructor has the interests of the students at heart; he is teaching for a purpose. It must be acknowledged that the average college student is unwilling to receive the very things for which he came to college. His exceptional privilege is absolutely overlooked for the lighter pleasures associated with college life. His resistance to the intrusion of knowledge remains with him, as Professor Canby says, until he is ready to leave college, when he realizes at last that he has disregarded his prerogative until it is too late.

If "The Undergraduate" receives the attention it deserves, Professor Canby will have done a great work. The author has only portrayed the problem confronting the majority of instructors in our greater universities, but he has done it in such a way as to set college men thinking. If we are not mistaken, Professor Canby will reap his reward, at least in some measure, before he had hoped to. Not that there will be a sweeping reform among the undergraduates. Such changes, if they are to be permanent, must come about slowly. The "mood for education" cannot be reached by leaps and bounds. Good, comprehensive reasoning, however, appeals to the undergraduate who is at the age when he wishes to absorb an understanding of the principles of life, though he may not know exactly what these principles are or how to grasp them. By showing him that his instructors have a keen appreciation of the problem confronting him and that they are "with him"—encouraging his good characteristics, endeavoring to correct his faults—the author of "The Undergraduate" has brought out a fact that has been little realized. With this realization in mind, the undergraduate is going to cease his resistance and he is going to make an effort to meet the professor half way.

## ATHLETICS AND THE YALE SPIRIT

OFTENTIMES large institutions, with a hundred years or so of brilliant records behind them, seem content, in a sort of self-complacent mood, to rest on their past achievements and forget that they have still other deeds to do and other victories to win; that competition is just as keen, even keener than ever before. A glance over Yale's athletic record of the past year seems to indicate that, with respect to athletics, Yale is in some such mood. After each defeat; after the loss of championships in each of the major sports, Yale undergraduates have pointed with pride at Yale's unparalleled record of the past. Only a few weeks ago the *News* printed statistics showing that Yale had won more and lost fewer games in football than any other of the large universities. It seems that instead of feeling keenly the shame of not keeping up Yale's splendid record, we soothe our disappointment by flaunting the victories of a dozen years ago. The fact that we are in a "slump" is not, in itself, disgraceful; the disgrace comes only when we are content to remain there.

Up until this past year a smaller university, whose marked success in football last season won it a place on Yale's 1913 schedule, was in much the same position as Yale is in now. For several years Lehigh had lost her championship games and her athletic rating dropped lower and lower. Last year's events came as a pleasant surprise. When the season was reviewed, instead of the customary string of defeats, it was found that Lehigh had lost only two football games—one to Princeton and the other to Carlisle, with the respectable score of 34-14 for the latter;—and further, that she had defeated her old rival, Lafayette, with a score of 12-0. Concerning this display of ability and energy, one of the papers, local to the University, prints the following:

"Lehigh's exceptional success in football last fall and basketball this winter has focussed attention upon the whole athletic situation at the University. The college has not simply a group of exceptional athletes, but a student body, every member of which indulges in some form of physical exercise.

"The new system was begun last year and has been markedly satisfactory. Upon recommendation of a committee from the

student body, which took the initiative in the matter, concurred in by the faculty, a reasonable amount of gymnasium or open-air exercise weekly was made compulsory for all students. Scholastic credit is given for compliance with regulations so established. Thus, in addition to the usual requirement for systematic exercise by the freshman class, the three upper classes are required to take regular exercise, and are credited on its proper performance with one term hour scholastically of the minimum number of term hours required to be accomplished to remain in college.

"This exercise may be taken, as provided by the regulations recommended by the joint committees and adapted by the faculty, in gymnastic work, fencing, wrestling, basketball, handball, bowling; all forms of out of door sports, such as tennis, baseball, football, lacrosse, track, and other field sports, cross-country runs, walks taken solely for the sake of exercise, skating, coasting, golf, boating, swimming, and other sports. The result has been most satisfactory. The system appeals to those who have passed the active athletic period by the thought that young men are voluntarily taking systematically, as a body, the open-air and gymnastic exercise required for their health and for their maintenance in good physical condition to support their study power. It appeals to the student body, and naturally so, in that it unquestionably develops and brings out athletic proficiency in many a man who, but for this system, with its scholastic credit, would not take part in athletic sports, and it thus supplies legitimate and welcome candidates for inter-class and intercollegiate teams."

In relating the above, there has been no effort to apply Lehigh's plan to the situation at Yale; Yale's problem is one which Yale alone must solve. In some points, however, we may learn valuable lessons.

In the first place Lehigh is governed largely by the students. Every Friday noon there is a mass meeting of the student body in Packer Hall, and woe betide the black-capped Freshman that is seen going in any other direction than towards the meeting. This meeting, presided over by the President of the Senior Class, is the center from which college spirit eminates. In it questions involving athletics are brought up and discussed, as well as matters of deportment and discipline; in fact all matters that concern the

student body are acted upon in this way. The plan is not complicated and the meeting is quite informal. The main value of it is: first, that it acquaints the undergraduate with the various situations in college affairs as they really exist; and secondly, as the initiative and carrying out of the plan is entirely on the part of the students, the success and responsibility of college affairs, in a like manner, rests upon them. In other words, it brings the university nearer to the individual undergraduate.

In the earlier days of Yale, the old College fence played, to a large extent, the part of a College meeting. That is the reason why it is held as one of the most treasured memories by many an alumnus. To-day the fence is gone. That, however, is not such a great calamity, except as it has lost to us one of Yale's oldest and dearest relics—there wouldn't have been room for us all on it, any way; the greatest misfortune is that there has never been anything instituted to take its place.

With this idea in mind, would the establishment of some such custom as the holding of University meetings every week or every two weeks in the gymnasium, or, even better, in Woolsey Hall, seem like an impossibility? Would it not be feasible for the chairman of The Coöperative Council to call and preside over such meetings and to bring matters of vital interest before the student body in a manner much more effective than the *News* is able to present them? This is not a plea for union, although it would result in that very thing. It would bring the men of all departments in closer touch with the University and would be in accordance with Yale's far-famed democracy. It would make the Yale spirit more real and tangible to us all. Instead of each man working with the idea of winning a letter or honors for himself, it would be conducive to, and develop the idea of winning for Yale. This is, however, a matter in which Yale undergraduates must take the initiative; a problem which they must solve. It is a plea for the revival of the old Yale spirit; a thing that at one time must have been the dominating influence of life at Yale, else it would never have been associated with those other words, "For God, for Country, and for Yale."

## THE 1914 BOARD

THE 1913 Board of the YALE SCIENTIFIC MONTHLY takes pleasure in announcing the following men to constitute the 1914 Editorial Board:

Peyton Randolph Anness, of New York City.
Jonathan Hunt, of Hot Springs, So. Dak.
Ernest Carlisle Hunter, of Savannah, Ga.
Harold Lee Wadsworth, of Detroit, Mich.

The Senior Charms this year were awarded to Brice Bowman, of Allentown, Pa., and William Seymour, of Chicago, Ill.

* *

## THE COMPETITION

FOR a year the competitors for positions on the 1914 S. Board have diligently contributed toward the success of the SCIENTIFIC MONTHLY. Many energetic hours have been passed by them in writing, office work, and other tedious toil—always, however, have they given their time freely and willingly. Then in the end come the elections—some are successful and some—well, we should like to have rewarded all who finished. To those whom we cannot reward, we extend our sincere thanks for aiding the MONTHLY and the unselfish way in which they gave up their time.

* *

## THE WISDOM OF FOOLISHNESS

WILL there ever be enough said about the foolishness of friendship,—not the foolishness of being friends, but the wisdom of being sometimes foolish friends? It seems that to the words, that we do not know each other until we dare be silent together, we might add, and until we dare be foolish

together. Many of us hoard as gold the foolish and nonsensical thoughts of our friends. The little jokes of friendship are treasured through many years and give life a flavor not often found. The ludicrous scenes of former times come back to give us new delight.

It is a question whether a friend is truly beloved unless we can "let ourselves go" with him; we demand of him the intimacy of relaxation. One may marvel at his wit and intellectual powers or lean upon his sympathy or judgment; but yet it is his moment of giving way to unconsidered mirth, his drop to sheer nonsense, that endears him to us. And thus it comes back to foolishness as a test.

With one friend one may be gay, with another serious; one is a charming playmate of the hour full of quips and jests, while the other ponders upon life and art. But the consummate and ideal friend must have a stride to match our own. There should be a tolerance in friendship that gives one an exemption from necessity,— a lack of demanding that one be this or that which makes it natural to do our prettiest. Diversity of fancy, the light sparring of contending wit, may weave a cloth that gives color to our day, and it is often the foolish and whimsical side of an affection that gives it its charms. Foolishness of friendship is the pleasant garden which lies around the solid structure of our friendship.

* *

M. S. DENMAN.

F. L. STEPHENSON, JR.

C. N. SNOWDEN, JR.
CAPTAIN OF 1913 CREW.

G. A. GORE.

A. V. L. BUGBEE.

SHEFF MEN, WHO WON THEIR "Y" IN CREW IN 1912.

*Courtesy Pach.*

## COMMUNICATION

THE SCIENTIFIC MONTHLY invites communications, but does not hold itself responsible for the sentiments expressed therein.

*To the Scientific Monthly:*

Now that spring is here we are again confronted with the exceedingly obnoxious presence of numerous "old clothes men", some of whom have hibernated during the short winter, only to make their reappearance the more offensive by the contrast. The ugly, unkempt creatures, who ply their trade on the street corners, plant themselves in the way of students walking to and from recitations, making it impossible to pass without noticing them. If a man stop for a moment's talk with a friend, he is interrupted by one of these Sheff parasites who offers "all you ask for old clothes" in an unpleasant, gutteral voice. Upon being rebuffed, the "old clothes man" either doggedly persists or else slowly retreats, uttering threats of murder.

It is time that Sheff was rid of this nuisance. Certainly, the college men do not want the "old clothes man". There are plenty of places where clothes may be sold, and at a greater profit than is made when dealing with the sidewalk merchant. Why such unsightly beings should be inflicted on us, is incomprehensible. The city would not tolerate them on the corner of Church and Chapel Streets; no more should we allow them to disfigure a corner which we necessarily pass so many times a day. Let's shatter another tradition and do away with the "old clothes man".

1914.

# THE MECHANICAL ENGINEERING INSPECTION TRIP

*A. B. Reeve.*

ON the morning of Wednesday, March 12, the Senior members of the Mechanical Engineering Course assembled at the railroad station to embark upon the annual engineering inspection trip, which after three years has won for itself a permanent and distinctive place in the curriculum of Senior year, and, besides being a requirement for graduation, is generally conceded to be one of the most interesting and instructive weeks in the whole course. Over sixty undergraduates boarded the special cars which were to take them to Springfield, each with his black and red covered note book, especially prepared for the occasion, for rough notes on the various plants visited were required each evening. The group leaders, each of whom were in charge of six or seven men, immediately started taking the attendance, which was done at each plant, as an insurance against absences, unintentional or otherwise. It might be said here that this group system is undoubtedly one of the factors which makes possible the successful handling of so large a crowd on these trips. The group leaders not only take attendance, but distribute information to the men in their groups as it comes to them from those in charge, and also collect and distribute the notes.

With few exceptions the men were all looking forward to a pleasant and instructive week, and even the few grumblers who prophesied seven days of foot-sore misery, in time forgot their pessimism in the big things seen and the magnificent treatment and hospitality accorded all by the various plants visited, and declared that it was "a good thing after all".

Holyoke, Massachusetts, was the first place visited, and here the party inspected the masonry dam which stretches for more than a thousand feet across the Connecticut River, and makes it possible to furnish water to the system of three canals in Holyoke from which 30,000 to 45,000 gross horse power is obtained. The well-known testing flume of the Holyoke Water Power Co. was also inspected, where hydraulic turbines are tested in great numbers, both for commercial and experimental purposes.

Two days were spent at Schenectady. At 8:15 on the morning of the first day, the party appeared before the gates of the General Electric Co. One bystander wondered at this invading army of over sixty men, and inquired if they were all applying for jobs; and there is a rumor that another individual accused the men of being strikers. As was usually the procedure, the party was in this case divided into small groups of nine or ten, each with a guide, before starting through the plant. This resembled a veritable city in itself, having well over a hun-

GROUP AT LARDNER'S POINT PUMPING STATION (NEAR PHILADELPHIA).

dred immense buildings, in which about 18,000 people were employed. The whole day was spent in the plant, lunch being taken in the company's dining rooms. An impressive conception of the immensity of the plant came home to each one as building after building disclosed new wonders, and turbines, motors, or machine tools, remarkable for their immensity, were seen on the one hand, and small instruments noted for their delicacy, on the other. Some electrical apparatus intended for the Panama Canal was viewed with great interest, as was a 30-inch

spark from a gigantic insulator testing transformer, which was kindly exhibited for the benefit of the visitors. It was a long trip around the plant and the men returned to their rooms well tired out. The miles traversed which were registered by pedometers carried by certain persons on this tour through the General Electric Co., must certainly be suppressed if the SCIENTIFIC MONTHLY is to maintain a reputation for accuracy and veracity.

However, there were still great things in store for the weary that night. The Yale Club of Schenectady had been far from idle, and the men found prepared for them at the Country Club a banquet, which was one of the features of the trip. Besides food and drink, there was an abundance of good-fellowship, and some old friends known at Sheff were met again with pleasure, while the older Yale graduates extended a warm and hearty welcome to the travelers. The evening ended with a series of bowling matches, and proved very enjoyable throughout.

The American Locomotive Works opened the eyes of a good many—a plant in which locomotives may be finished complete in from sixty to eighty days. The forging of large connecting rods by steam hammer interested some, while many remarked upon the rapid cutting and machinery of large parts in the shops. Track scales, which not only weighed the finished locomotives, but gave the load on each pair of wheels, were also seen. However, the great attraction was the erecting shop, where several enormous Mallet Articulated Compound Locomotives were to be seen in various stages of completion.

As an experiment the Watervliet Arsenal near Albany was visited for the first time, and proved well worth the effort. Ordnances of various kinds and sizes, ranging from three inches to fourteen inches, were being manufactured there. Some large guns were wound with square steel wire, while others were made up of a series of shells shrunk one on the other.

In New York the Mechanicals and Electricals united forces and on Monday appeared together at the Engineering Societies' Building, where they were cordially received by the Secretaries of the Mechanical and Electrical Societies. The handsome building was viewed with interest, especially the library, which is the larg-

est and most complete technical library in existence. The party then became the guests of the New York Edison Company, which supplied large automobiles to transport them to the Waterside and Interborough power stations. The large turbo-generator sets at the former plant, and the great reciprocating engines and exhaust steam turbines at the latter plant, were the main features. It was somewhat surprising, even to those familiar with the use of the condenser, to see the exhaust turbines at the Interborough station operating at times on less than atmospheric pressure!

SENIOR MECHANICAL ENGINEERS WAITING FOR GUIDES TO CONDUCT THEM THROUGH CRAMP'S SHIPYARD, PHILADELPHIA.

At noon the most splendid and enjoyable dinner of the trip was partaken of at one of the company's rooms. The writer recalls that the account of the trip last year, which appeared in the SCIENTIFIC MONTHLY was severely criticised because the author appeared much more impressed with the dinners and entertainments of the week than with the plants and shops visited. Judging from the hospitality shown by the Edison Company this year, it was their fault that such a criticism was possible, and if the

critic had known it, there were certainly extenuating circumstances. Mr. Murray, Mr. Geib and Mr. Williams of the company were present, and speeches by the last two gentlemen were heard with interest. It is only expressing the general sentiment to say that all were very grateful for the many kindnesses shown by the New York Edison Company.

After going through the Grand Central Station, the Electricals and Mechanicals separated. On Monday the plant of the Keuffel and Esser Co. at Hoboken was visited, which was a decided change from the previous plants, which produced mostly large and heavy machinery. Here one was impressed with fineness and accuracy of the work carried on, especially in the optical department, where large navy gun sights and range-finders were made. The company very kindly presented each man with a pocket steel tape. The Henry R. Worthington Hydraulic Works near Newark, N. J., were then viewed, and the train was taken for Philadelphia. Here the large triple expansion pumping engines of the Gardner's Plant Station were inspected, after which the party went through Independence Hall and the beautiful building of the Curtis Publishing Company. In the afternoon, Cramp's Shipyard was visited, where several good sized ships, including a number of torpedo-boat destroyers, were seen in the process of construction.

On Wednesday the men went to the Bethlehem Steel Works, which, being without doubt the most spectacular plant seen, formed a fitting climax to the trip. The management took especial pains to make the visit both profitable and pleasant, a printed schedule being followed in making the rounds of the plant. The forging of large hollow cylinders for fourteen-inch guns was an impressive sight, but even more wonderful was the forging of tremendous slabs of glowing steel for armor-plate by means of a 14,000-ton hydraulic press. The Bessemer converter was seen in full blast, and the rolling mills, where red hot ingots were rolled into structural beams, proved to be a center of attraction.

This ended the trip, although a few men on invitation remained in Philadelphia in order to see the plant of the Duplex Wire Company, makers of copper clad steel wire of peculiar merit. It

should be said that the company spared nothing in making this visit interesting and enjoyable.

Although most of the men were glad when the trip was over because of the shear physical fatigue resulting from going to so many places in so short a time, the concensus of opinion was that it was profitable and a great success. As was said in a speech at one of the dinners, because of such a trip a college man will not be as much inclined to "accept a position" as to "look for a job" after graduation! It may be said that great credit is due those who planned and managed the trip, and we cannot close without expressing our gratitude and appreciation of the many courtesies shown by the various plants and organizations visited.

## THE SENIOR ELECTRICAL INSPECTION TRIP

*R. P. Hart.*

THE Second Annual Inspection Trip of the Senior Class of Electrical Engineers lasted from March 13 to March 19. For the first three days headquarters were in New York, and points of interest in the immediate vicinity were visited. Headquarters were then changed to Pittsburgh, and the plants in that neighborhood were given a critical inspection. Part of the class, who were unable to go to Pittsburgh, returned to New Haven, where they spent the time in visiting plants there, as well as in Bridgeport and Branford.

The first place visited was the Brooklyn Navy Yard. It has its own power plant, which is thoroughly up-to-date, as well as the testing laboratories, where all the materials and apparatus which go into the naval service are tested. A particularly interesting test was that of a Gyro-compass, which is used to indicate the meridian. The dry dock at the yard is 700 feet long, 110 feet wide, and about 40 feet deep. It can be emptied in an hour and a half if there is no ship in it, and in about an hour if there is a large ship therein. In the afternoon of the same day, the 13th, the battleship *Arkansas* was visited, which was then in dry dock. It was a very interesting inspection visit on account of the large amount of electrical apparatus on board the ship. It costs from four to five hundred thousand dollars to equip a battleship with the necessary electrical apparatus. Much interest is shown by the government in the safety of the sailors, as is demonstrated by the large number of safety appliances.

The morning of March 14 was spent at the General Electric Lamp Works at Harrison, N. J., the manufacture of carbon and tungsten filament lamps being demonstrated from start to finish. Early in the afternoon the party visited the new aqueduct which will carry the water supply from the Catskills, under the Hudson River, to New York City and Brooklyn. The tunnel is bored through the solid rock, and is 14 feet in diameter and 210 feet below the ground level. Electric cars, worked by storage bat-

teries, transport the materials in the tunnel. Later in the same afternoon the instruction car of the Subway system was visited. There the prospective motormen are examined as to their ability. A number of safety devices proved very interesting. On account of the fast speed of the subway cars they must be kept in the best possible condition, and are therefore inspected after each thousand-mile run.

On the next day, Saturday, the Electricals joined forces with the Mechanicals and inspected the Engineering Societies' Building on Thirty-ninth Street, New York City. After visiting the Waterside Station of the New York Edison Company, the party enjoyed an excellent lunch at the Edison Company's substation on Fifty-ninth Street. After lunch the power plant of the Interboro Company was inspected. The day was finished by a visit to the new Grand Central Terminal.

All day Monday was spent ot the works of the Westinghouse Company in East Pittsburgh. A number of short trips of an hour and a half to two hours were made, between which a half-hour lecture was given by some member of the firm. That evening the Yale men in the employ of the company entertained the visitors, Mr. Herr, a Sheff man, and the President of the Company, giving a very enjoyable talk.

The Macbeth and Evans Class Company's plant at Charleroi, about forty miles from Pittsburg, was visited the next day. There, various glassware in process of manufacture was inspected.

The party stopped off at McKeesport on the way back and visited the National Tube Company. This large plant manufactures steel pipes and boiler tubes.

Wednesday morning the party returned to the Westinghouse Company's plant in East Pittsburgh, where the men spent their time examining certain features which they had missed on their previous visit. The private telephone exchange and Heating Appliance Department proved very interesting. The men then proceeded to the Westinghouse Machine Company's plant, which was near by. After lunching there, they returned to Pittsburgh and inspected the plant of the Carnegie Steel Company.

This ended the trip, which, taken as a whole, proved most enjoyable and successful in every way.

LUNCHEON GIVEN IN HONOR OF THE SENIOR MECHANICAL AND ELECTRICAL ENGINEERS BY THE NEW YORK EDISON COMPANY, DURING THE SENIOR INSPECTION TRIP, MARCH 15TH, 1913.

# HISTORY OF YALE UNDERGRADUATE PUBLICATIONS

*J. Hunt.*

THE undergraduate is prone to accept the institutions of Yale as a matter of course. This article is intended to afford an opportunity to those interested to find out something about the undergraduate publications of this University, both past and present.

The first Yale paper was the *Literary Cabinet*, which was established November 15, 1806, and published for one year by three Seniors, the price being one dollar per year. The next publication to enter the field at Yale was called the *Atheneum*. It was published from February 12, 1814, to August 6 of the same year. During the succeeding twenty years several new periodicals were published, but none of these survived for very long. These publications were the *Microscope*, which was founded on March 21, 1820; the *Yale Crayon*, founded in 1823; the *Sitting Room*, whose first issue appeared on March 17, 1830; the *Student's Companion*, which was issued from January to April in 1831; the *Little Gentleman*, issued in January, 1831; the *Gridiron*, of February, of the same year; and the *Medley*, which ran from November 8 until June in 1833.

However, a magazine was finally started which made a permanent success. This was the *Yale Literary Magazine*. William T. Bacon and Horace Colton, both of the 1837 Class, are credited with first conceiving the idea. They succeeded in interesting Henry C. Davis and W. M. Evarts, two other members of their class, in the idea, and the first issue appeared in February, 1836. It is interesting to note that the only one of the four originators who was elected to the first board of editors was Evarts. The "*Lit*", as it is popularly known, was the first college paper which really succeeded, and indeed is one of the oldest magazines now in existence. The custom of electing the editors by a class vote continues, but now is merely a form, since the class elects the leaders of the competition.

About two years after the founding of the first permanent periodical at Yale, appeared a short-lived paper known as the *Yale Liter-*

*ary Quidnunc.* In 1841, however, the first annual was issued, namely the *Yale Banner.* For more than twenty years this was only a double sheet of quarto size. The next few years saw a perfect epidemic of new publications. In 1841 the *Collegian* appeared, to be followed by the *Yale Banger,* which ran from 1845 until 1852; and the *Yale Tomahawk,* which, beginning in 1847, was published for about four years. Eighteen-fifty-seven was a great year for the literary men, for the *Galliniper, Hornet,* and *Battery,* were all published for a short time. During the same year the *Yale Review* published its first number. It subsequently ceased issue, but was refounded about a year ago, although not as an undergraduate publication. The *University Quarterly* appeared from January, 1860, to October, 1861.

The *Pot Pourri* was founded in 1865 and was issued until 1908, when it was amalgamated with the *Yale Banner.* The next publication, the *College Critic and City of Elms,* was short-lived, but in November of that same year, 1865, there appeared a weekly college paper known as the *Yale Courant.* In 1867 it changed its name to the *College Courant,* with correspondents at various colleges. This had, however, an undergraduate department, which in 1870 became a separate publication under the revived name of the *Yale Courant.* About this time, however, two unsuccessful periodicals appeared, the *Yale Index,* in 1869 and the *Yale Nautical Almanac,* in 1872. In the latter year, some dissatisfaction with the management of the *Courant* led to the establishment of the *Yale Record* in 1873. After 1876 these two rival publications, the *Courant* and *Record,* were issued bi-weekly. In 1878 the first daily appeared. It was rather bold in its statements and, after trouble with the faculty, suspended publication. It was started again in the same year, but it was not until 1879 that the *Yale Daily News* really began its regular issues, which have continued down to the present day. It was a rather doubtful proposition at the time of its foundation, but time has shown that the experiment was more than successful. "The oldest college daily" has indeed prospered. The establishment of the *News* rather invaded the field of the *Courant* and the *Record,* and they were obliged to turn to the literary field to some extent. In 1887 a humorous page was introduced into the *Record,* and

three years later it became an acknowledged comic paper, thus ending a fourteen years bitter rivalry. In 1882 and 1884, respectively, the *Yale Critic* and the *Yale Quip* made brief appearances. In June, 1891, the *News* issued a weekly edition known as the *Yale Alumni Weekly*, which later became an independent graduate publication.

The *Yale Law Journal* made its initial bow in October, 1891. This magazine was issued twice a term, but now is issued monthly. The *Association Quarterly* appeared for a short time, starting in the same year, but in 1893, the *Yale Shingle*, the Law School annual, began its issues. In 1894 began the *Yale Medical Journal*, which only ceased its publications during the past year.

In 1894 seven members of the Scheffield Scientific School established the YALE SCIENTIFIC MONTHLY.

The recent ventures have not been very numerous, although the *Yale Monthly Magazine* and the *Student Daily Post* began their brief careers in 1906 and 1908. A couple of years ago another daily paper was nearly started, the *Yale Daily Herald*, but the men behind the venture gave up the idea before it materialized. In 1908 the two annuals, the *Banner* and the *Pot Pourri*, which occupied the same field, combined under the title of the *Yale Banner and Pot Pourri*.

From the foregoing it will be seen that nearly forty publications have been issued by Yale undergraduates. The majority of these were short-lived and, after a brief period, suspended publication.

Of those that remain, the *Yale Daily News* is a newspaper; the *Yale Literary Magazine*, a monthly periodical containing literature by the undergraduates; the *Courant*, also literary, but of a lighter vein and with a wider field; the *Record*, humorous; the SCIENTIFIC MONTHLY is the Sheff organ; the *Banner-Pot Pourri*, the University Year Book; the *Shingle*, the Law School annual; the *Alumni Weekly* (not published by undergraduates any more), the graduate news organ; and the *Law Jou. nal*, the monthly legal magazine.

# THE CAUSES LEADING TO THE MEXICAN SITUATION

*J. Hunt.*

IN 1821, after about eleven years of fighting, the last Spanish viceroy, named O'Donoju, surrendered Mexico City to the revolutionists, and the fight for the independence of Mexico from Spain was won. Internal peace, however, was by no means obtained. During the fifty-nine years which followed, that is, between 1821 and 1880, fifty-two dictators, presidents and rulers held the power, the vast majority of these having obtained it by force. One revolution succeeded another with bewildering rapidity. When one examines the conditions, however, it will be found that the struggle was not so much between rival generals during this period, but between two different classes of people. It was a struggle between the privileged classes, which included, besides the very rich land-owners, the enormously rich and powerful clergy, and also at times the army; and the common people. Later we find the struggle between Centralists and Federalists, the former the army, church, and in general the supporters of despotism; the latter the advocates of republicanism and local self-government.

However, in 1876, Porfirio Diaz came into power, an event which was destined to bring peace and progress to the country for the next thirty years. The son of an innkeeper in the city of Oaxaca, in the southern province of the same name, Diaz had been originally intended to be a priest. At the age of sixteen, however, he had left the church. Eight years later, in 1854, he entered the service of a rebel leader, Alvarez, who was at that time conducting a revolution against Santa Anna. Young Diaz found army life to his liking and remained a soldier. He was promoted rapidly, becoming a captain in 1856, a lieutenant-colonel and later colonel in 1859, a brigadier general in 1861, and a general in command of one of the main divisions of the army in 1863. When Mexico was made into an empire under Maximilian, Diaz refused to recognize the emperor, and during the entire period of the empire, he fought against it. After the expulsion of the foreigners, he retired and was not before the public much until 1876,

when he led an insurrection against President Lerdo. Having captured the City of Mexico on November 24, 1876, he was proclaimed president on May 2 of the following year. Diaz's term expired in 1880 and, under the then existing Constitution, he was ineligible for immediate re-election. Accordingly, Gonzalez, one of the members of Diaz's cabinet, was elected and served until 1884, when Diaz was unanimously re-elected. The Constitution having been changed, he was again and again re-elected, until finally, in 1911, he was obliged to resign from office.

The thirty-two years during which Porfirio Diaz was president of Mexico, are unquestionably the best days that Mexico has seen, at least since the Spanish conquest. His rule was extremely autocratic, the "iron hand" being effective in quelling anyone who questioned his actions. Nevertheless, this stern old dictator did much for his country. He fostered interior development and economic progress. He endeavored to develop manufactures by a protective tariff, and introduced new industries into the country, notably the production of silk, wine, cocoa, and quinine. He promoted forestry and encouraged colonization. Under his administration the railroads and telegraphs of Mexico were built. One of his greatest desires was to put the national credit on a firm basis, and this he succeeded in doing. The problem of welding together the people of the nation was a hard one, and he was but partially successful. When one considers that there are about one hundred and fifty different Indian tribes in Mexico, and that of the population 38 per cent are of pure Indian blood and 43 per cent of mixed Indian and European blood, the magnanimity of the task becomes apparent.

It must not be supposed that the government of Diaz was popular, however. While Diaz did a great deal of good for the country, his autocratic rule made him very unpopular. There were practically no revolutions against him after 1884, but he was almost as cordially hated as was the old French regime by the peasants of that country. The causes of this are readily understandable. Diaz surrounded himself with a group of individuals who came to be known as *Cientificos,* from the fact that they claimed to be governing the country in a scientific way. They represented in general the large economic interests of the country,

and to offset the corruption of their government pointed to the improvements that they had enacted. Their sole plea or platform was that the continuance in office of Diaz was necessary to the welfare of the country. The taxes were heavy and much corruption grew up in all the government, even extending to the small local officers. The large landowners were assisted in many cases in defrauding small landowners of their property. Moreover, a very barbarous custom spread over the country. This was the peonage and contract labor system which was virtual

DAMAGE TO A STATUE.

*Courtesy Collier's.*

slavery for many people. There was little open opposition to the rule of the Cientificos, however, for it took a strong and a brave man to oppose them.

At last, however, the opponents to the Diaz government found their leader in Madero. Francisco I. Madero was born on October 4, 1873, on the estate of his grandfather, Don Evaristo Madero, in the State of Coahuila. This old gentleman was enormously rich, his estate being valued at about $25,000,000 at the

time of his death. For some years young Madero remained on this vast estate, and under his administration it became one of the largest and most prosperous in Mexico. At this time he distinguished himself by being a vigorous opponent of the system of peonage and contract labor. Having moved to the City of Mexico, he first was brought to the attention of the public by his declaration in 1903, in an interview, that his previous criminal indifference to conditions had been given a rude shock by the election massacres in Monterey on April 2, of that year. He immediately took up the cause of the independent voters and opposed the rule of the Cientificos, first in his own state of Coahuila, and later in the whole of Mexico. As a means, he formed an extensive system of political clubs, called the *Club Demicratico Benito Juarez*. This club had branches in almost all parts of the Mexican Republic. With the aid of these clubs he introduced the American system of state conventions, which culminated in a national convention of his new party in the capital city.

As acknowledged leader of the independents, he had fought in 1905 for the election of an anti-Diaz governor of Coahuila. In anticipation of the coming election, Madero proceeded to write a book about the conditions. This book was called *The Presidential Succession of 1910*. It created a tremendous sensation, being merciless against the government, while yet absolutely fair. It won much favor on that account. The government immediately ordered the confiscation of all copies and prohibited its sale, but Diaz did not molest Madero himself but left him alone. The latter, having announced himself as a candidate for the presidency, and having received the assurement of support from the opponents of Diaz, started out on a speaking tour, during the course of which he made bold to attack the Cientificos and to oppose the reëlection of Diaz, and his vice-president, Ramon Corral. This was the last straw, and on June 27, 1910, he was arrested at Monterey. It was a flagrant violation of the Mexican law, for the warrant contained no formal charges, and did not even contain the signature and seal of the judge. After his trial he was sent back to prison on a charge of libelling one Juan Orci, a political supporter of Corral. He was kept here until Diaz's reëlection was assured, after which his friends were allowed to bail him out for the sum of $10,000.

This was a fatal mistake on the part of the old dictator, for the days of peace and tranquility were now over for him. Soon were to begin that series of revolutions which for the last three years has kept the country in a continual turmoil.

Madero proceeded to the city of San Luis Potosi, where on October 15, 1910, he issued his famous "cry to arms". This was a perfectly definite political platform, and contained as its main features the two catch-phrases "effective suffrage" and "no re-elections". It also advocated reforms in the distribution of land, the free restitution of the land which had been wrested from the

TREE IN ALAMEDA GARDENS FELLED BY A SHELL.

*Courtesy of Leslie's Weekly, Copyrighted Leslie Judge Company, 1913.*

Indians, the liberation of all political prisoners, the abolishing of the military practice of making convicted criminals enter the army, and an effective guarantee of the constitutional rights of free speech and free press.

Madero had fixed the night of November 29, 1910, for his general uprising, but news of this leaked out in some way, and it actually occurred on the twentieth of the month. The first outbreaks occurred in the states of Chihuahua and Durango. By January of the next year it was evident that the insurrectos were gaining ground. The government troops were defeated at San

Agnacio and at Galanea. The Maderistas threatened the cities of Chihuahua and Juarez. Uprisings occurred in Vera Cruz and in Oaxaca. Diaz and his government now began to show signs of being worried. Madero announced that he would not lay down his arms until Diaz resigned and many reforms were enacted. The old dictator, who had not capitulated to the enemy for so many years, now realized that the situation was very serious. In an address to Congress on April 1, 1911, he outlined many reforms, including the safeguarding of the suffrage, the reform of the federal judiciary, division of the large estates, no reëlection of high officials and the general elimination of graft from the government. The Cientificos were dismissed from their positions of authority and a new and more liberal cabinet was formed. General Bernardo Reyes, who had been exiled some years before on account of his great popularity with the army and the people in general, was asked to return. Francisco de la Barra, a prominent statesman, was recalled from the United States, where he was ambassador, and made Minister of Foreign Affairs. Diaz thus was endeavoring to surround himself with popular characters. He even tried to negotiate with Madero.

This tardy programme of reform came too late, however. Several southern states were now in revolt, Yucatan, Campeche, and Guerrero being overrun with raiders.

Trouble with the United States seemed to be imminent. Alarmed at the danger to Americans, the government had mobilized over 20,000 United States troops on the border by the 7th of March. Nothing was done, however.

Madero, however, consented to negotiate with Diaz, and on May 3, peace conferences began at Ciudad Juarez. Nothing could be decided and on May 6, war began again. The revolt grew rapidly and even broke out in the capital, and by May 10, the city of Juarez was in the hands of Madero. Diaz realized the futility of further conflict and, peace negotiations having been resumed, it was agreed that Diaz and Corral should resign and that de la Barra should become provisional president, pending an election, which was to be held within six months. On May 18 peace was proclaimed, and a week later, on the twenty-fifth, Diaz resigned, and immediately sailed for Spain. So passed this pic-

turesque old character who had ruled over the destinies of Mexico for over thirty years.

De la Barra, thus unexpectedly elevated to the chief position of the country, acted with great tact and discrimination towards all factions. He immediately issued a call for an election to be held on October 1, each state and territory to have six presidential electors. As was expected by all, Francisco Indalecio Madero was elected president by a large majority, receiving about 95 per cent of the votes. Jose Marino Pino Suarez was in turn elected vice-president by a vote of about 30 per cent of all the votes cast.

BALDERAS STREET AFTER THE STORM OF SHOT AND SHELL.

*Courtesy of Leslie's Weekly, Copyrighted Leslie Judge Company, 1913.*

De la Barra resigned on the fourth of November, and Madero was inaugurated two days later, and on the twenty-third Pino Suarez was also inaugurated. The only candidate against Madero was Reyes, but he, seeing that his chances were worthless, resigned and left the country. Madero's main plan of government was for constitutionality and no reëlections.

However, Madero was destined to prove the adage, "uneasy rests the head that wears a crown". No sooner was he settled than General Reyes returned and attempted to raise the flag of revolt. He received such little backing that he surrendered to the

government troops on Christmas Day. The people did not at that time want a revolt, for they had confidence in Madero and looked to him for great reforms. The reforms, however, were not very generally enacted. A country cannot be changed over night. Grafting, corruption and over-ambition were charged. Some feeling against Madero grew up, and his brother, Gustave, whom he had placed in his cabinet, became one of the worst hated men in Mexico. It was said that he had appropriated much government money. Francisco was, after all, more or less of an idealist, it is said, and permitted unwise counsels to sway him. The "iron hand" had been felt so long that in its absence the people, feeling free, did not remain keepers of law and order.

Several revolts broke out. In the south, Emiliano Zapata, who had rebelled against Diaz, refused to make the peace and continued his guerilla warfare. A few others were still active. Of these, General Campa captured Ciudad Juarez on the 27th of February, 1912. Out of this incident grew much trouble. Pascual Orozco, one of Madero's generals, who had been placed in command of Chihuahua, took most of his army and joined Campa. Immediately Madero sent General Huerta against him, with the result that the Federals defeated the Orozistas at Rellano in June. On July 4, Huerta was again victorious at Bachimba, and the rebels retreated north. They evacuated Chihuahua, which had been their capital and set up headquarters at Juarez on July 11. Two days previous the Federals occupied Chihuahua. The rebels were now in bad shape. Most of their organization went to pieces, and they divided into smaller divisions led by Salazar, Rojas, Campa, Escabon, and several others. The Federals, however, advanced, and on the 20th of August occupied Juarez, the rebels fleeing into the State of Sonora, where they soon broke up into hundreds of small bands, waging guerrilla warfare.

Meanwhile, in the south, conditions were in bad shape. Serious revolts took place in the States of Puebla, Mexico, Vera Cruz and Michoacan. The city of Oaxaca was besieged by 5,000 rebels. In the north, things were just as bad, Zacatecas, Durango, San Luis Potosi, and northern Coahuila, all being the scene of uprisings. Many Americans and other foreigners began to leave the country, fearing for their lives. Orozco reappeared on

December 18 and captured Cases Grandes, but his army was scattered and he was not in a position to do much. Thus last December saw nearly the whole of Mexico subject to guerrilla warfare.

On October 16, however, something more serious happened. General Felix Diaz, nephew of Porfirio Diaz, captured Vera Cruz by a *coup d'état*. Madero for a time was worried, but about a week later young Diaz was captured by General Belthan. Diaz was imprisoned in the National Arsenal in the capital, where Reyes was already confined.

However, on February 9, the cadets in the arsenal released the prisoners, who joined General Mondragon and his army, and as-


FEDERAL TROOPS RESTING DURING A LULL IN THE FIRING.

*Courtesy of Leslie's Weekly, Copyrighted Leslie Judge Company, 1913.*

saulted Madero in the National Palace. Being repulsed, they retreated to the arsenal and began to prepare for more serious warfare. Reyes was killed in the assault. On February 11, there began that terrible artillery battle which was fought in the heart of the city. On the second day of the battle, General Blanquet arrived on the outskirts of the city, but helped neither Madero nor Diaz, apparently restraining his 1,200 Federals to pick the winner. After a week's fighting, General Huerta, Madero's commander-in-chief, suddenly imprisoned his president

and on the next day assumed the provisional presidency with the promises of coöperation of both Diaz and Blanquet. During the seven days' battle it is estimated that 3,000 were killed and 7,000 were wounded. Millions of dollars of property was destroyed.

What the outcome of the new government will be it is impossible to predict. It is evident that the "iron hand" has returned. Gustave Madero has been executed. A day later witnessed the murder of both Francisco Madero and Pino Suarez. Almost every day brings its toll of executions. As far as the rest of the country is concerned, many of the rebels have submitted, Orozco being among them, it is said. The plan is to enlist the rebels and make a standing army of 150,000 men, with which to subdue the country. It is to be essentially a military government. Elections are soon to be held. Feliz Diaz and probably a number of others will become candidates. The future does not look too rosy. Three separate generals with their followers are coöperating at present in the capital, many more "generals" with their followers are scattered throughout the country. It will take a strong man to combine these elements.

We have now seen the Diaz government wrecked because it was too despotical, the Madero government because it was not despotical enough. The question is whether or not a republic can exist in Mexico. It is problematical, to say the least, and time alone can tell.

# GRADUATE OPINION ON YALE DEMOCRACY AND MORALS

*William Seymour.*

ANY undergraduate has doubtless seen from time to time various articles in the different publications on the decline of college democracy. Every once in a while some newspaper publishes an account of how the snobbishness at Harvard or Yale is increasing, or that some club or society, through its undemocratic spirit, is poisoning the minds of the world at large against the reputation that a college education is supposed to have. These articles are violent and often bitter in their attack, and are written with great temerity. As the result of such attacks as these we frequently hear the question asked: "Are college morals and democracy on the wane, and the higher educational institution none other than a place where the wealthy students lead a life of debauchery, while the man who is working his way through is considered as being unfit for them, the wealthier students, to associate with?"

In order to ascertain as nearly as possible the true status of the democratic spirit and moral tone at Yale an investigation was started. The only feasible method of determining the answer to this question was to obtain the consensus of opinion on the subject among the older graduates. At first it was thought this opinion could be best secured by writing to several hundred of the graduates, but later events proved this to be undesirable, as the great majority of graduates have not kept in touch with the life of to-day at Yale. Therefore this plan was abandoned, and it was decided to consult the class secretaries only, and to abide by their opinion. Following out this idea, a letter was sent to each of the secretaries of every class, both Academic and Sheff, between 1875 and 1900, it being thought that men who graduated later than 1900 would not be capable of judging correctly the difference between past and present conditions. The class secretaries were chosen because it was thought that they, if anybody, would be familiar with the situation and conditions. They, as a

rule, keep in pretty close contact with the affairs at the University, and are thus able to judge more accurately the true progress that Yale is making along its democratic and moral course.

It was expected that there would be a great difference in opinion, and the replies fully verified the expectation. Although the individual men had different ideas, there was in the majority of the replies a similarity of views from which it has been possible to deduct with a fair degree of accuracy a consensus of opinion. It was further asked of the secretaries what they would suggest as being the best remedy, providing they thought one to be necessary. This last will be discussed by itself. We will consider this material under three different heads, namely: the democratic spirit; the moral tone; and, finally, the remedy.

Commencing with the question, is the spirit at Yale as democratic now as it was in former years, we find that most of the graduates are of the opinion that it is not. Of course there are some who take exception to this statement. There are several reasons given as the cause for this. It seems to be generally thought that, in the good old days, a man's standing in college depended solely on himself. If he were the right sort he got acquainted with every one in his class, and could count on most of them being his friends. No questions were asked as to who his father and mother were, nor what they did. The fact that he lived in a big house or a little one had no bearing on his popularity with the rest of the class. In other words, outside social position counted for very little while he was in college.

Changes of considerable importance have crept in since then, and it is now maintained that a great deal depends on a man's pedigree and social position in the outside world. The classes have grown much larger, with the result that the familiarity of an intimate acquaintance is largely lacking. Another thing to which most of the graduates attribute the decline in democracy is the presence of wealth as a factor in college life. Men with large means often leave town over Sundays, which tends to keep that class from associating with the rest of the student body in the life outside of the class room. Cliques are more prevalent now than formerly, and this tends to separate the men into strata outside of which they rarely venture. Here again

the difference in wealth is claimed to be a cause, for how can you expect a man who is working his way through college or laboring under other financial handicaps to run around with the sons of rich men? It is impossible for the former to keep up the pace of the latter set, which prevents them from having much in common.

Of course, on the athletic field we find conditions present that have an opposite effect, an effect that does a great deal to offset the influence due to wealth, since here the man must stand on his merits alone. But only a small percentage of the students are athletes of sufficient ability to be able to compete for the University teams; therefore, while this tendency is along the right line, its ultimate result is minimized to a great extent on account of its not reaching a large enough number of men.

Summarizing, then, the causes for the lack of more democracy, there are three causes for this that stand out more prominently than the others. In the first place, we have a large variety of men of great difference in wealth and social position, causing cliques that have wedged themselves into the life of the University, and which are recognized as being anything but promoters of democratic feeling. Next, the growth of the college itself has had its effect, and, as said before, the larger classes make it harder for men to become as well acquainted as they formerly did in the smaller ones. And an intimate acquaintance is a prime factor in the equation of college democracy. Finally, it is asserted that the conditions of the times have caused a change in all of the colleges, as well as throughout the country. This change, naturally enough, has entered into the University. These three reasons seem to be pretty substantial ground upon which to base the statement that the democratic spirit at Yale has been on the decline during the past few decades.

It is very gratifying to turn from the somewhat disappointing opinions on the loss of democratic spirit to the information that the graduates think the moral tone of the University at present to be much better than it was in their undergraduate days. All of the letters that gave any opinion at all on the latter subject voiced a very optimistic tone on the moral status, and, where any predictions were made, all seemed to be that the future would see

a still greater improvement in the moral life of the college. The graduates declare that there is much less drunkenness now than ever before. Formerly, it was not uncommon for nearly all of the men in a class to be imbibers of some sort of liquor, although not nearly this entire number were heavy enough drinkers to reach the hands of the discipline committee. Nevertheless, it was not uncommon to see in those days monster parties at Mory's which often resulted in the necessity of having several of the participants helped home. Perhaps, it is suggested, that, now some of these scenes have been transferred to New York. Keg parties and similar functions even now are not entirely obsolete, although they are undoubtedly obsolescent.

That there has been a great change is a fact that is easily proven. The number of men who are interested in the work of the Y. M. C. A. has grown at a most promising rate. Every year sees more Freshmen entering this work and attending the Wednesday night meetings in Byers Hall, as well as those held in other places in the University. Fewer cases of drunkenness are being brought up before the Discipline Committee, and, as we cannot imagine the present committee to be less alert or strict than previous ones, the answer must lie in the fact that there is less drinking. It is further claimed that the big men of the college are interested in the moral improvement of college life, and they themselves set examples which undoubtedly have their good effect on the rest of the student body. Another thing that brings us towards the same conclusion is the fact that cheating in class and in examinations has been for the most part stopped.

There are several reasons set forth as being the prime movers in this change, and it is well worth a little time to see what they are. In the first place, a movement was started some years ago which led to the Academic Senior Societies lending a helping hand. Probably the frowning by the upper classmen upon immoral practices has done a great deal to restrain the under classmen. This movement was furthered by the Senior Councils and the faculty, until it reached its culmination in Sheff, by the adoption of the honor system, which, it is hoped, will create a spirit of honesty among the future Freshmen that will eventually stamp out all cribbing. Also the consensus of opinion seems to be that the

grade of scholarship has risen. This is merely an opinion that is not based on any statistics. A greater number of men who are pursuing their work more earnestly are now in college, which has resulted in the fact that the atmosphere along scholastic lines has improved.

Briefly surveying the material placed in our hands, we come to the conclusion that it is the opinion of the graduates that the moral tone of the University has improved during the past generation; all indications point to a continuance of this in the future.

Although the graduates as a rule had positive ideas that they were free to express on the questions of democracy and morals they did not have any remedy that a majority agreed upon. The remedy spoken of here relates to the question, "What is the best remedy to bring back more of the democratic spirit?" Far too great a variety of suggestions were submitted to have them all given here, therefore we will content ourselves with a few that seem to be the most feasible, although their practicability is admitted to be doubtful by their authors. In order to do away with the influence due to too much wealth, it is suggested that a custom be established making it prohibitory for a student to spend more than a moderate sum while in college. Instead of having the wealthy men dressed as if they had just stepped out of the proverbial band box, thereby presenting a marked contrast to some of the others, let all the students go around dressed with moderation. In several of the colleges the men make it a practice to go around in their old clothes. Also by preventing so many of the students going to New York every Sunday, more of the men would spend their time in New Haven, thereby furthering the chances for extended acquaintances. Another suggestion is, to provide for more class smokers and similar functions, which will have a tendency to unite the men. Mass meetings, songs, and inter-class games of all kinds would also help answer this purpose. It is advocated that more chance be given to the mediocre athletes by arranging for second and third teams, which shall have matches scheduled with teams of equal caliber in the other universities. By following out this plan, a great number of men who lack the ability to successfully compete for the

University teams would be led into athletics. Some suitable insignia could be awarded in order to make it a mark of some distinction to make one of these teams. Much along this line is already being done.

Another remedy suggested is one that is intended to operate in the class room. This scheme advocates the changing of a percentage of the personnel of the divisions each year. For example, suppose a class be divided alphabetically into four divisions during the Freshman year, then, when Sophomore year comes around, twenty-five per cent of the men are to be shifted in each division, and this change followed out each year, so that in four years the entire division will be changed, and each man will have spent an entire year in the same division with every other man of the class.

Giving the entire ground a final survey, it is evident that the graduate opinion, as far as can be determined from the class secretaries, is that while the democratic life has suffered in the past few years, the moral tone has improved. Several remedies have been suggested for the former, but, as has been said before, their originators realize the difficulty in carrying them out, and only offer them as suggestions. In closing, it might be said that we deeply regret any loss in democratic spirit, and hope that every undergraduate will do his part to bring back this vital organ of Yale's life into a good healthy condition.

# NATIONAL HIGHWAYS

*E. Carlisle Hunter.*

THE question as to the advisability of building national highways has been continually considered by the United States legislative body, but has never been acted upon to any great extent. Different states have undertaken to build main roads to connect

A CHARAN ROAD BEFORE IMPROVEMENT.

*Courtesy Motor Life.*

their principal cities, but the question of highways joining the four corners of the United States has been but a dream. It has not been an idle dream, however, because as a foundation, a National Highways Association has been formed to bring before the eyes of the people of the United States the necessity for well planned and well built roads.

Perhaps few of us realize how the building of new roads would effect us. The high cost of living is one of the questions uppermost in the public mind to-day. Yet how many of us ever considered how directly roads bear upon this subject? In the transportation of farm products, a farmer sometimes has to undergo the most serious difficulties. To put it in figures, it costs an American farmer more to haul a load of potatoes ten miles over ordinary country roads, than it would for this same farmer to ship them from New York to Liverpool. This moving of products is one of the greatest expenses which the agriculturist has to meet, and if this were lessened it would not only help the farmer himself, but would bring the prices of farm products down to their normal place. For instance, a team of horses could easily haul seventy bushels of potatoes over ten miles of good roads with less wear and tear on the wagon, than in going a mile on America's ordinary country road. According to government statistics, the average haul of farm products in the United States is 9 4-10 miles, and the average cost per ton a mile in this country is twenty-three cents, while in Holland, where there are improved roads, it is but eight cents. With the above figures as a basis, $1.41 is lost on every ton produced in the United States. Moreover about 300,000,000 tons of farm truck are raised annually in this country, which, if calculated with a loss of $1.41 per ton, would make $420,000,000, or enough to build good roads through every state largely devoted to agriculture.

Farmers living in districts through which good roads have been built are more than mildly enthusiastic on the subject. With the advantage of being in nearer relationship with the city and so to their markets, they willingly pay their road tax and deem it a good investment. State Grange Master J. Arthur Sherwood, of the State Grange, concisely summarizes the attitude of the farmers on the subject: "The grange is, and should be, the champion of good roads. The increasing number of motor vehicles upon our highways presents a problem difficult of solution. The legitimate demand of automobile traffic must be met. Stretches of road here and there are pleasing, but the continuous mileage is what the farmer as well as the motorist desires. I believe that a continuation of our present policy in Connecticut will insure this, in due time."

If only the energy and time turned to improving country roads could be put into dollars and cents, the results would be surprising. In this country there are 2,115,000 miles of roads and but 155,000 miles of them has been improved in the slightest degree, which includes the all too inefficient "working of the roads" by farmers. On these almost two million miles of very poor roads, travel 25,000,000 farm horses and mules, 1,600,000 horse-drawn vehicles, and 850,000 motor vehicles. These are valued at

THE SAME ROAD AFTER IMPROVEMENT.

*Courtesy Motor Life.*

$4,000,000,000, and the rough usage is estimated to have increased 10 per cent over usage on good roads. Here are $400,000,000 which would build 20,000 miles of real roads annually.

Now that the necessity of good roads has been established, it might be well to run back into the history of the "Good Roads" movement. The policy of the Federal Government of doing a certain share of state work was established more than a hundred years ago under the provision of the Federal Constitution empow-

ering Congress to establish post offices and post roads. The Federal Government in 1803 began appropriating funds for road building. This was continued until 1832, when steam railroads attracted national attention and good roads were temporarily forgotten. This lull, which marked progress in canals and railroads, but not highways, continued for half a century. Not until 1892 was anything of note done, when New Jersey began organizing state highway departments. From that time the increase has been steady and rapid. The following statistics, as compiled by the American Automobile Association, will show this progress:

MILEAGE AND COST OF STATE ROADS TO END OF 1911.

| State. | Miles. | Cost. |
|---|---|---|
| Maine | 766 | $ 2,011,253 |
| New Hampshire | 757 | 1,626,255 |
| Vermont | 1,187 | 1,878,862 |
| Massachusetts | 880 | 8,012,655 |
| Rhode Island | 288 | 1,623,922 |
| Connecticut | 1,168 | 6,539,204 |
| New York | *2,940 | 48,955,000 |
| New Jersey | 1,578 | 9,691,098 |
| Pennsylvania | 727 | 8,188,092 |
| Maryland | 334 | 5,178,761 |
| Virginia | 852 | 2,329,907 |
| Ohio | 265 | 3,768,928 |
| Washington | 347 | 1,335,069 |
| Total | 12,089 | $101,139,006 |

* 710 additional under contract.

The subdivisions of the United States,—township, county, state, and nation as a whole,—each play an important part in the development of good roads. The township must have its streets or lateral roads, the county its market roads, the nation its roads to connect the states into one great unit. The local or state conditions have been well met, and now the vital question is that of national highways. The farmers have been sounded and found willing to aid in any way possible, but it is the legislature that must act. This subject, however, is far from new to this body, as may be seen from successful conventions that have been held.

The first of these was called by the American Automobile Association at Washington in January, 1912. At this convention, 43 states were represented by delegates, 23 of the states sending delegates named by governors. In addition were representatives of 28 large commercial bodies, 17 good roads associations, 44 state automobile associations, and many automobile clubs.

In 1912, about fifty bills were brought before Congress, all having the idea of Federal aid in one form or another. The one which perhaps has attracted the most attention is the "Shackleford plan". It originated as an amendment to the Post Office Appropriation Bill, and while killed in the Senate, has reappeared. Briefly, it provides for a classification of all roads on United States mail routes, and for the payment by the Government of an annual sum, as rental in consideration of the fact that the Government uses these roads. These payments range from $15 to $25 per mile, according to the character of the roads. Friends of the good roads movement have been resolutely opposed to the measure. It might be well to give the reasons given by certain Senators for not supporting the bill.

Senator Root of New York said: "To put the Federal Government alone in the position of having to pay for using a public highway which is free to all the rest of the world, is nothing but a plain flimsy subterfuge to get money out of the Federal Treasury."

The reasons why the bill was killed were as follows, according to Senator Jonathan Bourne, Jr.: "First, it did not provide that the Federal appropriation should be expended in highway improvement. Second, it established the policy of obligating the Government to pay to local committees compensation for the use of highways in conducting the rural free delivery service—a service that is conducted at a great loss to the Government and for the special benefit of the communities served. Third, it was the beginning of a system of compensation that has not been carefully considered, but which when once adopted would certainly grow to immense proportions."

Senator Briston of Kansas says: "It is preposterous and almost unthinkable, and I do not believe any considerable number of citizens would demand such a thing. If we were going to make

a Federal contribution to the creation of a good roads system, let us make it openly and squarely and fairly for that purpose. To my mind, it is the most amazing proposition ever presented to an intelligent body of men for their consideration."

Representative Beall of Texas, says: "I regret that I cannot support this proposition to charge the Federal Government an annual rental for using the roads and delivering mail to the people. It does not seem to me to be quite fair or square for the people of my district to say to the Government that, although its use of the roads is to serve them, it must pay for the use of the roads in doing so."

The defeat of the bill and the words of these men both go to show that the good roads movement has friends in both houses of the legislature. This means that good roads and national highways are not to be a dream of the past, but a reality. Laurens Enos, President of the American Automobile Association, even estimated that $25,000,000,000 will be spent for good roads within the next twenty-five years.

# THE SHEFFIELD CHRISTIAN ASSOCIATION

*H. H. Vreeland, Jr.*

THIS organization is an association of those men interested in religious affairs for the purpose of intensifying their personal religious faith by means of frequent inspirational meetings and of expressing their religious convictions by definite service to others. It endeavors to assist all members of the Scientific School in every way possible and, although it reaches by no means as large a number as it should, yet it is believed that the work which it does accomplish is well worth while.

It is not remarkable that the majority of the men in Sheff do not engage actively in the work of the Association, but it is surprising that so small a number of those interested in religious affairs, and even of those most religiously inclined, take an interest in its activities. This is caused either by a feeling on their part that they are too busy to engage in these activities or by an unaccountable indifference to the work. Possibly more fellows would engage in the work if they more clearly realized the advantages gained from so doing. The purpose of the work is not to afford an outlet to the emotions of a small group of the extremely pious, but to interest the largest possible number of the broad-minded in active Christian service to others both here in New Haven and in their home communities.

The Association endeavors to be of service to the incoming Freshmen by providing them with copies of the Association Handbook, more commonly known as the "Freshman Bible," which contains, in addition to an account of the various lines of work of the Association, a list of the different college organizations, Yale customs, information regarding New Haven, etc., and other necessary and valuable knowledge. Also, during the first few days of college, an Information Bureau is conducted through which the Freshmen can obtain information in regard to cheap boarding places, rooms, etc., and can be assisted in securing positions. Last Fall this bureau, located in Byers Hall, was of service to about one hundred men, twenty of whom were helped in obtain-

ing positions, such as waiting on tables, tending furnaces, etc. The night after the opening of college a large reception is held in Byers Hall, to which all the Freshmen are invited, and at which President Hadley, Director Chittenden, and the leaders of the various college activities speak. It would seem that this sort of service to those who are strangers among us, but who are soon to become our friends and neighbors, is well worth while, and if not done by the Association would of necessity have to be performed either by the School or by the University.

The religious side of the Association work is confined to the Wednesday meetings and the various Bible Classes. Through the former it is hoped to interest the undergraduates in the practical present-day problems which Christianity is called upon to face. Few of us in Sheff have any knowledge of, or interest in, those difficult and important questions which are at present engaging the thoughtful consideration of the most patriotic citizens of this and other countries. When can we more profitably study the important religious and economic problems than while here at college? It is the purpose of the Wednesday meetings to present these questions in a clear and interesting manner, and then to demonstrate the fact that these problems can be most successfully solved by applying the principles of Christianity to the every day life of the individual and the community. It is planned to make these meetings next year more practical and valuable than ever before, and in this way it is hoped that a much larger number of Sheff men may be benefited by them.

The Bible Classes are an attempt to demonstrate the possibility and advisability of applying the principles of Christ to the complex and too often self-centered life of the undergraduate. It is hoped that these groups may be a means of intensifying the religious life of those most interested in the work of the Association. That there is a definite field for such work is proved by the interest shown in the Freshman Bible Class during the last few years.

The largest and perhaps most successful fruitful branch of Association work is that which includes the various forms of community service carried on in and around New Haven by the undergraduates. Through this sort of work these undergrad-

uates are brought in contact with the members of the different social classes which go to make up the community, and by this close and intimate contact gain a first-hand knowledge of the social and economic conditions under which these people are living.

The largest part of this service work is done by the Industrial Service Committee, which organizes and supervises many classes led by Sheff men among the American and foreign workingmen. Great development has been made in all the branches of this work during the present year. In addition to the evening classes conducted in the homes and clubs of the workingmen, noon-hour classes have been carried on in several factories and foundries. These have proved very successful and it is planned to greatly increase the size and scope of this work next year. Besides the classes in English, lectures have been given on "First Aid" in a number of factories, and several successful classes in Mechanical Drawing, Mathematics, Theoretical Mechanics, Civics, and History have been carried on at various places about the city. About sixty Sheff men have been active in the work during the year, and many others could easily have been obtained had more classes been organized.

This work accomplishes a great practical good by bringing those students, who are soon to go out into the industrial and engineering fields, into contact with those types of laboring men with which they will have to deal. Frequent letters from recent Sheff graduates assure us that the knowledge gained by them through these classes has been invaluable to them in their various lines of work. By personal contact with the laboring men a feeling of mutual appreciation and sympathy arises which will do much to better the relations between capital and labor. This contact can be gained in no better nor more natural way than in one of these classes where the students and the laboring men meet together as friends and equals.

The interest shown in the Boys' Club work during the present year has been most encouraging. More than thirty Sheff men have been in some branch of this work, and the groups conducted by some of them have been exceptionally successful. This sort of work is really productive of more tangible results than any of

the other kinds of service work, for by it the lives of a number of boys may be made better and richer through the unselfish efforts of some devoted and patriotic student.

In these many ways, the Christian Association hopes to aid some Sheff men in becoming better Christian citizens and becoming more valuable to the community in which they live by teaching them how they can best serve their fellow men. If it can accomplish this, all those engaged in forwarding the work will feel that their time has been well spent and that the Association has no need of apologizing for its existence.

# THE DEVELOPMENT OF WATER POWER IN THE UNITED STATES

*Peyton R. Anness.*

THE water powers of the United States constitute a national resource of steadily growing importance. Within the last decade, the development of transmission of electrical power has enormously enhanced the value of water power. Prior to this, water power, in that it could not be transmitted over any distance, could be utilized only at the power site. Thus the development ol electric transmission of power, not only provided a means of supplying distant manufacturing and domestic demands, but also opened up an entirely new field for water power in the operation of street railways and lighting plants. It also enabled water power to compete, as was never before possible, with other means of power production. This has greatly enhanced the relative importance of water power.

Mechanical power is, of course, the basic necessity of industry. However plentiful may seem the present supply of our chief fuel powers—coal, natural gas, and petroleum—their quantity is practically fixed and can never be increased. Some geologists estimate that, at the present rapid rate of increase in production, our coal supply will be exhausted in 150 years. Water power is then the only important source of mechanical power now practically available that is self-renewing and perpetual.

As has already been said, the comparatively recent progress in electrical science has greatly increased the economic importance of water powers. Electric transmission, which has now been made commercially practicable, permits power to be carried a distance of from two to three hundred miles. In other words, a given water power site is able to reach a marketing area of at least 100,000 square miles.

The need of water power is indeed obvious. The chief factor in the economic importance of the development of this natural resource is its ability to compete with and replace other methods of power production. The more extensive the utilization of

water power the longer our supplies of other fuel will last. It is estimated by the Geological Survey that the water power now in use in the United States effects a saving of over 33,000,000 tons of coal annually. Since the use of water power thus tends to conserve the fuel supply of the country without in any way diminishing the future supply of water power, the development of this industry is of the utmost economic importance to the conservation of our other natural resources. The total power required to operate the industrial enterprises and public-service utilities of this country was, by the statistics for 1907, approximately 23,000,000 horse-power. Of this, 82 per cent was developed by steam, 15 per cent by water power, and 3 per cent by internal combustion engines. It is estimated, since no statistics for accurate information are available at present, that the power now required totals over 30,000,000 horse power. Of this, about 6,000,000, or 20 per cent, are developed by water power. This, as has been shown, represents the saving of an enormous quantity of coal annually. It is therefore obvious that the further development of our water power resources would effect a still further conservation of coal, which would be of the utmost economic importance to the future of the nation. Thus it is highly important that the potential water powers should, as far as is commercially profitable, be completely utilized.

In any discussion of the water power possibilities of the United States, certain physical and economic factors must be taken into consideration. One peculiarity of this industry is that the production and consumption of power must be simultaneous. It is not practically possible to store the overproduction of any period for future demands when the production may be light. This fact is of great importance, owing to the wide variations of demand for power at different periods of time. This fluctuation of demand is due to the fact that the chief uses of power are for manufacturing, traction and lighting purposes. In each of these uses, the demand is much greater during certain hours of the day than during others. If the greatest demand from each of these sources came at different periods of the day, the total would be so distributed as to reduce the total maximum capacity required. Unfortunately, however, the highest demands for traction come at a

VERNAL FALLS IN THE YOSEMITE NATIONAL PARK, CAPABLE OF DEVELOPING GREAT POWER.

time when the demand for manufacturing is at its height. This overlapping of demand for consumption creates what is known as the "peak of the load". It is necessary, therefore, to provide sufficient power to meet this maximum demand.

In addition to this problem of fluctuating demand, there is also one of the variation in the supply of water power available. This is caused by the extreme irregularity of the flow of streams. The force of the current and the volume of the flow vary with the seasons, with the rainfall, and depend to a large extent upon the character of the drainage basin. It is necessary, therefore, in installing a water power system, to take into account all these various factors. When the installation provides for the utilization of the minimum flow only, great energy is lost in periods of great flow. On the other hand, it is impracticable to install power up to the maximum potentially available.

This problem, therefore, of utilizing the greatest possible energy economically available from our water system is one of great complexity. There are, however, several means of approximating the solution of the question. The physical effect of irregularity in the flow of streams may be partially overcome by the adoption of systems of storage. By storage is meant the gathering of large volumes of water in reservoir systems at the headwaters of the stream, storing it for a considerable period of time until necessity requires its release. In this way, the use of storage systems would enable the surplus waters of the flood seasons to be held in reserve and utilized to supplement the decreased flow of the dry seasons, thus tending to equalize the flow. Such reservoir systems have already been installed by manufacturing concerns who utilize water power, at the headwaters of several of our smaller rivers. These have tended to equalize the flow of such streams and have more than paid for themselves by the increase their construction has effected in the power available from the streams. While such systems greatly increase the potential of a water power site, it is very difficult to form any estimate, which would be reliable, as to the total water power possibilities of the United States, taking into consideration the possible developments in this line. There are very few distinctively storage systems in this country. All estimates in regard to storage are

therefore chiefly theoretical. Some of our larger rivers have a variation in flow so great that the cost of developing a reservoir system to remedy it would be so great as to be practically prohibitive. In all cases, in order that reservoirs shall be more effective, it is very necessary that the forests be preserved on the headwaters of the streams feeding them. Otherwise the great quantities of silt carried down by the waters in times of flood would rapidly fill the reservoirs with debris. Reservoir systems, then, can be successful only when in conjunction with forests.

THE WATER POWER PLANTS AT NIAGARA FALLS.

Just as the variation of supply of water power may in great part be remedied by storage systems, so the fluctuations of demand may to a great extent be overcome by the "coupling up" of sites and markets. By "coupling up" is meant the unification of two or more sites accessible to the same market. The most efficient utilization of water power tends directly toward concentration of control. Since there is a limit to storage, and since in no case can sufficient storage be maintained to give any stream anything like the power representing its maximum flow, it is obvious that a very decided advantage can be gained by "coupling up" of sites. It often happens that of two sites tributary to a single market,

neither will meet the demand for power, whereas by these combined, sufficient power can be developed to supply such demand. Another advantage is that in practically all cases some of the installments can cease operations when the highest demand is over and accumulate pondage to be utilized to meet the highest demand of the next day. By pondage is meant the accumulation of water from day to day in the power-dam ponds during that portion of the day when the consumption of power is lowest. By this arrangement, if one installment is able alone to supply the lowest demand, during that time the other sites can remain idle and store up water which will contribute to meet the larger demand during the busiest period of each succeeding day.

The great fluctuations of supply and demand of power cannot, therefore, be entirely overcome even by a combination of storage, pondage, and "coupling up". These aid greatly in the equalization of such variation, but the remaining irregularity is most effectively remedied by the use of auxiliary steam plants. In nearly all cases, hydraulic concerns have found it necessary to provide sufficient steam auxiliaries to meet variations not otherwise remedied.

Thus we see that in general there is a great tendency toward concentration of ownership or control in the development of water power sites. The variations of supply and demand of power described above require the unification of development in order to obtain the highest efficiency and economy in the utilization of the resources. This unifying of installments results naturally in the concentration of ownership, or at least in the monopoly of control, of the water power developments of a locality. There are, then, in the case of water power, special forces, aside from the general tendency toward concentration of all public utilities and industrial enterprises, which act strongly in contributing to this end. The problem of economy has a very marked bearing upon this question of unification of installments. The development of large water power sites, as a general rule, costs more than the requirements of the average manufacturer will justify as an investment for power. As a consequence only the smaller sites can be economically developed by individual concerns. Again, a small water power, operated independently, very rarely justifies the

comparatively large investment which is usually necessary for transmission and distributing lines. However, by the "coupling up" of several such small sites, the saving in cost of transmission lines often makes this development commercially practicable. Thus the question of economy is an extremely important factor in the development of water power. The element of cost, in this as in all other industries, is the fundamental consideration. The cost of construction of a large water power plant is necessarily very great. The financing of such a project is therefore one of the most serious problems encountered. The element of uncer-

NIAGARA FALLS, THE GREATEST WATER POWER IN AMERICA.

tainty also enters to a large extent into the development of power sites. It often happens the estimates as to the amount of power available are exaggerated. Each installment presents its own peculiar problems. The construction of dams and power houses, in that they must be of the most substantial nature, is very costly. The majority of the large water power sites of this country are at a considerable distance from the power markets. This necessitates the building of expensive transmission lines to carry the power to the points of consumption. The cost of these lines, while it naturally varies according to the distance of the power

site from the market, is often greater than that of the dam and power house construction. The average cost, in this country, of installment, including the construction of dams, the erection of transmission lines, and other equipment, is between $100 and $200 per horse power. This high cost of development of water power sites renders coupling of installments necessary to lessen the expense and obtain the highest possible efficiency.

This concentration of ownership or control of water powers has already been developed to enormous proportions in this country. Water power sites are generally grouped geographically in such a way that each group is almost entirely independent of outside groups. This greatly narrows the extent of possible competition. A water power in California, for instance, can hardly compete with one in New York. Each group, therefore, stands isolated, and the control of such a zone of available power naturally becomes an effective monopoly of a very valuable natural resource. This great concentration movement is therefore a matter of great public concern.

Another form of combination of control is found in cases where large consumers of power, such as traction and lighting companies, have, for obvious reasons, acquired and developed water power sites as a part of their public service systems. In a like manner, many hydro-electric companies have gained control of public utilities corporations. This combination of public-service companies and hydro-electric systems has already been developed to a very high degree and is steadily increasing. While the extent of ownership and control cannot always be stated exactly, it is known that a few large corporations have become powerful factors in the water power situation in this country. Moreover, concentration along this line is constantly increasing in scope and strength.

Such, then, is the present situation with respect to the water power development of this country. The adoption of a positive governmental policy—either Federal or State, or both—in regard to this problem is of the utmost importance. The very fact that one of the greatest of our natural resources is involved necessitates such a policy. The fundamental problems of the situation are to insure the best development of the resource, to protect the consumer, and to reserve for the benefit of the whole public its

proper share in the advantages inherent in the natural resource itself.

The complete and effective utilization of water power is of the utmost importance. Unlike other natural resources, water power is not diminished by use nor conserved by non-use. The real waste of water power is its non-use. The importance of effectively utilizing this natural resource is obvious. Our supply of coal and other fuels, though vast, is not unlimited in extent. The utilization of water power will therefore result in a saving to the future of the nation. The millions of water power economically available, but as yet undeveloped, represent absolute waste.

The decided monopolistic tendencies of water power, due chiefly to the peculiar factors of that industry described above, require the adoption of a governmental policy to protect the consumer. Owing to the fact that the most economical and efficient development of water power resources can be attained only under a high degree of unified control of sites in large areas, this protection cannot result from competition. The advantages of concentrated control have already been described. The necessity of "coupling up" of sites and unification of storage brings about this monopoly of the water powers in the different sections of the country. In so far as the benefits of a great public resource thus tend to become the private property of a few individuals or corporations, some effective policy of public control is imperatively necessary for the protection of the consumer.

The third principle which any governmental policy must take into consideration is the securing for the public its share in the advantages of this resource. With respect to those water power sites which are now held by private interests, regulation and control can be applied by taxation or by the exercise of eminent domain. In regard to those water powers on the public domain, and it must be noted that the government still owns a very large percentage of the available power sites of the country, the problem could be solved by the adoption of a leasing system. This would enable the government to oversee the proper development of the sites, regulate both the production and price of power, and would secure for the people their proper interest in the advantages of the resource.

Whatever method of control may be adopted as the most equitable and efficient, the necessity for some such policy of regulation is obvious both from the requirements of conservation and because of the monopolistic tendencies inherent in the development of this resource.

# THE RELATION OF AESTHETICS TO ENGINEERING

*Brice Bowman.*

AS a nation we are coming more and more to regard and to study the value of aesthetics in its relation to industry and other interests of a more distinctly public nature. There was, however, a period in our industrial progress and expansion when a comparatively small amount of capital had to be stretched to the very limit in order to make it come anywhere near meeting the demands put upon it. Expenditures could be made only for things that were absolutely necessary, and very little thought, time, or money could be spared for architecture, landscape gardening, interior decoration, and other allied arts.

To even a novice it is evident that the growth of American railroad systems has been something enormous. Thousands of miles of track were laid through sections of country that were little more than wilderness; miles upon miles of steel rails threaded their way through rough mountainous country, along the steep sides of canyons thousands of feet deep, and over mountain passes where perpetual snows hung ever ready to hurl avalanches of ice and rock upon the workmen. Under such conditions there was little money that could be spared for the erection of stately terminals, beautiful wayside stations, or bridges that could boast of anything else than rough efficiency.

For years the increase in population in some sections of the country, due to immigration, has been so great that there has been neither time nor capital to house the new-comers in anything but rough frame houses and brick tenements, which are notorious, both for their box-like architecture and their unsanitary construction.

In public buildings, too,—schools, churches, and buildings of all sorts,—there has been, until within the last few years, this same lack of consideration for architectural beauty.

Fortunately, that period when poverty and the lack of time were the ruling factors in most enterprises is past. Our railroads are permanently established and the countries through which they run are giving in return millions of dollars yearly in mineral and vegetable wealth. We are rapidly assimilating and

taking care of our immigrants. Our commercial and industrial institutions are now on a firm basis. We are beginning, more and more, to demand beautiful and harmonious surroundings, and also to learn that, to a large extent, the quality of our work depends upon the harmony of our environment; that we are stimulated by external beauty to produce results, both physical and mental, which shall correspond with such surroundings. To this end many factories and business houses are spending large sums of money, not only in improving the architecture of their buildings, but in furnishing better and more sanitary homes for their employees. Railroads are erecting terminals, such as the Grand Central in New York City, and the Union Stations in Chicago and St. Louis, which are wonders of efficiency and architectural beauty; and stations, which a few years ago were little more than wooden shanties, are now being replaced by permanent masonry structures, and, where land is not too expensive, are often surrounded by small parks. Public buildings are no longer erected with the single idea of furnishing a shelter for the public offices and a place in which to keep public records, but with the idea that each building is a monument to our greatness and dignity as a nation.

Such is only the natural course of events. Now that we have opened up our vast natural resources and no longer have to contend with a rough and undeveloped country, we are in a position to take time to consider the refinements of civilization. As a people, we are learning to appreciate art.

It is evident that in many branches of his work, the civil engineer must give great consideration to and work in conjunction with architects and landscape gardeners, as for example: laying out parks, planning cities, and in structural designing. With this idea in mind, Mr. Lord, the new Director of the Architectural School of Columbia University, speaking before some of his colleagues at a recent dinner, said: "The architect's training should embrace instruction in all the arts and he should work in closer relation with other artists—the sculptor and the painter. He should work in much closer relation with the engineer, and we are all satisfied that the engineer should work much more in harmony with the architect or at least be possessed of certain architectural knowledge which would aid him in de-

signing the various structures that it is a part of his work to build."

To anyone at all familiar with the work of a civil engineer, it seems absurd to add still another item to the long list of subjects with which he must be conversant. But still we must not forget that those great and magnificent structures of the periods of the Renaissance, which are the despair of our modern architects, were built by artists who,—besides being architects, painters, and sculptors,—were in many cases masters of all three arts and constructing engineers at the same time. How these men obtained their knowledge or what courses of study they pursued, we do not know. All we do know is that they have left us cathedrals and churches, which not only rank among the world's greatest works of art, but also among the great feats of engineering. History tells us, too, that the walls and fortifications of the old Italian cities were planned and built under the direction of these same great artist-engineers.

If, then, we are going to hand on to posterity great and enduring structures, like those which have come down to us, the constructing engineer must either be an artist himself or have an understanding of architecture that will enable him to interpret and put into effect the ideas of the architect. Many schools appreciate this condition and are giving courses in architecture, aside from those given in the regular architectural schools.

In a report given last year before the American Institute of Architects by a committee appointed to investigate and forward the study of architecture throughout this country, Mr. Ralph Adams Cram, the chairman of that committee, summed up the results of its investigations in the following words: "Let us use such influence as we have towards ensuring the inclusion in this broader curriculum of a proper study of the Fine Arts, not as in themselves examples of intensive specialization, but as an essential part of all civilization, past, present and future; not as technical and historical courses, but in the light of that true philosophy of aesthetics that sees art as an essential part of a well-rounded man and of the civilization he creates; as one of the truest tests and exemplars of the history of any people and of their contribution to civilization, and as a cultural study that cannot be eliminated from any adequate education."

# WHERE SHEFF MEN COME FROM

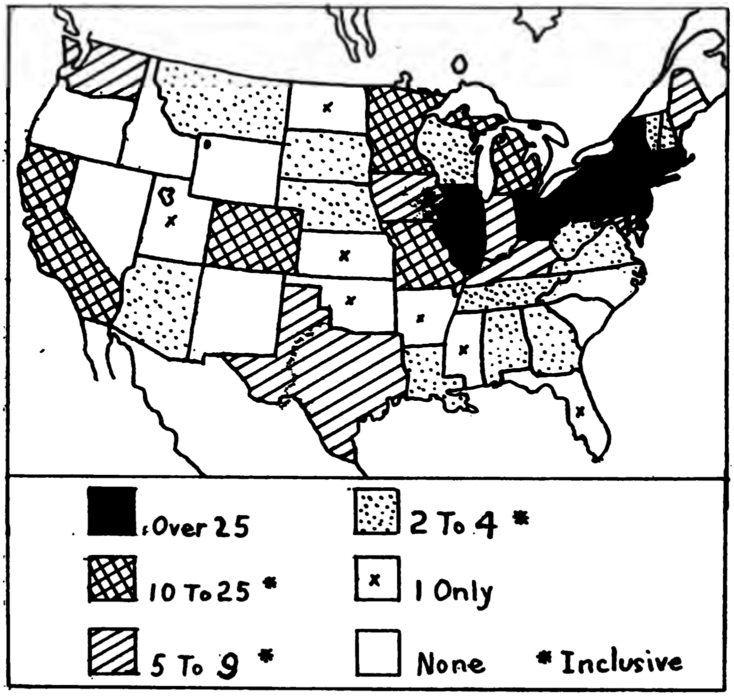
*A. F. Blake.*

MANY interesting facts about the geographical distribution of the homes of the students of the Sheffield Scientific School are revealed by a study of the catalogue. The accompanying table shows clearly the enrollment according to states and foreign countries. Of the 1,069 undergraduates, all are from the United States except seventeen, who represent seven foreign countries. Turkey is surprisingly well represented with six individuals, and distant China sends four men here.

Coming to our own country, it is interesting to notice the comparative numbers of students coming from the different sections. The northeastern states lead, as would naturally be expected. Connecticut, alone, furnishes very nearly one-third of the entire enrollment, and the four states of Connecticut, New York, Pennsylvania and Massachusetts, together, furnish almost exactly two-thirds. But although distance is an important factor in determining the number of men from any given locality, yet there are some remarkable exceptions. The other New England states besides Connecticut and Massachusetts seem to be very poorly represented in Sheff, considering their nearness. The populations of Vermont and New Hampshire are small, it is true, but it seems as if more than three each might be expected from these states. The small delegation from Rhode Island is especially remarkable. This is a very small state, of course, but the most densely populated in the Union, and only two hours' ride from New Haven. Yet Rhode Island is now sending only seven men to Sheff, quite a contrast with the other two adjacent states. Washington and California, three thousand miles away, each send more than double this number, and Colorado twice as many. Even Turkey sends only one man less.

The states of the middle west, particularly Illinois, Ohio, Minnesota, Michigan and Missouri, send large delegations. Those on the Pacific coast, considering their distance, are well represented with the exception of Oregon. It is interesting to notice

that whereas Washington and California send nine and twelve respectively, Oregon, between the two, sends none at all. The territory between the middle west and the extreme west, except Colorado, has few representatives here. Fewer Sheff men come from the southern states than from any other section of the country. No state sends more than nine. Texas and Kentucky lead.




DIAGRAMATICAL CHART SHOWING WHERE SHEFF MEN COME FROM.

It is an interesting fact that the states in which our very largest cities are situated all stand near the head of the list. The six largest cities are New York, Chicago, Philadelphia, St. Louis, Boston, and Cleveland, and the states containing them all have o rank not lower than tenth in the list. As a matter of fact, to a large extent Yale students do come from the larger cities.

## Where Sheff Men Come From.

| State or Country. | 1913. | 1914. | 1915. | Total. |
|---|---|---|---|---|
| Connecticut | 95 | 127 | 145 | 367 |
| New York | 48 | 61 | 88 | 197 |
| Pennsylvania | 16 | 30 | 32 | 78 |
| Massachusetts | 16 | 29 | 28 | 73 |
| Illinois | 16 | 15 | 21 | 52 |
| New Jersey | 10 | 21 | 19 | 50 |
| Ohio | 8 | 11 | 19 | 38 |
| Minnesota | 3 | 8 | 13 | 24 |
| Missouri | 4 | 8 | 7 | 19 |
| Michigan | 6 | 5 | 5 | 16 |
| Colorado | 2 | 5 | 7 | 14 |
| California | 4 | 6 | 2 | 12 |
| Indiana | 2 | 3 | 4 | 9 |
| Texas | 5 | 2 | 2 | 9 |
| Washington | 3 | 1 | 5 | 9 |
| Iowa | 2 | 3 | 2 | 7 |
| District of Columbia | 2 | 0 | 5 | 7 |
| Kentucky | 3 | 3 | 1 | 7 |
| Maine | 2 | 3 | 2 | 7 |
| Rhode Island | 1 | 3 | 3 | 7 |
| Turkey | 3 | 2 | 1 | 6 |
| Maryland | 1 | 2 | 2 | 5 |
| Tennessee | 0 | 1 | 3 | 4 |
| China | 1 | 1 | 2 | 4 |
| Virginia | 1 | 1 | 2 | 4 |
| Wisconsin | 2 | 1 | 1 | 4 |
| Alabama | 0 | 1 | 2 | 3 |
| Arizona | 2 | 0 | 1 | 3 |
| Georgia | 0 | 2 | 1 | 3 |
| New Hampshire | 0 | 2 | 1 | 3 |
| Vermont | 1 | 1 | 1 | 3 |
| Louisiana | 0 | 1 | 1 | 2 |
| Montana | 1 | 1 | 0 | 2 |
| Nebraska | 0 | 0 | 2 | 2 |
| South Dakota | 0 | 1 | 1 | 2 |

| State or Country. | 1913. | 1914. | 1915. | Total. |
|---|---|---|---|---|
| West Virginia | 1 | 0 | 1 | 2 |
| Hawaiian Islands | 0 | 1 | 1 | 2 |
| Arkansas | 0 | 0 | 1 | 1 |
| Cuba | 0 | 0 | 1 | 1 |
| British Columbia | 1 | 0 | 0 | 1 |
| Delaware | 1 | 0 | 0 | 1 |
| England | 0 | 1 | 0 | 1 |
| Florida | 0 | 1 | 0 | 1 |
| Germany | 0 | 1 | 0 | 1 |
| Kansas | 1 | 0 | 0 | 1 |
| Mississippi | 0 | 1 | 0 | 1 |
| North Dakota | 0 | 0 | 1 | 1 |
| Oklahoma | 1 | 0 | 0 | 1 |
| Switzerland | 0 | 0 | 1 | 1 |
| Utah | 1 | 0 | 0 | 1 |
| Idaho | 0 | 0 | 0 | 0 |
| Nevada | 0 | 0 | 0 | 0 |
| New Mexico | 0 | 0 | 0 | 0 |
| North Carolina | 0 | 0 | 0 | 0 |
| Oregon | 0 | 0 | 0 | 0 |
| South Carolina | 0 | 0 | 0 | 0 |
| Wyoming | 0 | 0 | 0 | 0 |
| Total | 268 | 374 | 427 | 1069 |

# POSSIBILITIES OF AIR WARFARE

*C. W. Smith.*

WE all know what General Sherman said about war. But he was only speaking from experience in land and naval warfare. The next great international struggle will undoubtedly be largely fought in the air and will certainly verify Sherman's conclusion. A great deal has been done by the Germans, French, and the English in building, equipping, and perfecting air navies, and the work has been very successful on the whole. The Germans are far in the lead in this work. One of Count Zeppelin's most recently constructed dirigibles, carrying its full armament, besides a crew of twenty-one men, averaged forty miles an hour for a distance of twelve hundred miles. There is no doubt but that some of his larger and faster crafts will be actively effective in a two thousand mile radius.

Evenly matched powers in the air will make war problems vastly more complicated, as well as numerous. If the powers are not fairly matched, the stronger force could successfully terminate the war in a few days after its declaration. The nation having a powerful fleet of large dirigible airships,—call them dreadnaughts if you wish,—accompanied by a scouting corps of aeroplanes having a speed capacity of up to and over a hundred miles per hour, could render a naval force or army, no matter how large, useless and helpless. The dirigibles have been so highly developed in their management that they are little affected except by extremely bad weather, and so could molest a fleet or an army post with little difficulty and almost incessantly, having in the first case a transport for its basis of supplies and in the second a temporary or home camp. The Germans demonstrated the possibility of the former not long ago by dropping a dirigible to a position over the North German Lloyd S. S. *Amerika*.

Germany is now increasing her already large air fleet by building nine dirigibles. Another twelve months will see a still greater development in this branch. Some three hundred aeroplanes are now in the German service and several hundred more will be

added to this number within a short time. To manipulate these, the government has a corps of more than four hundred graduated pilots, showing the seriousness with which the Empire is pursuing its policy. France and England have begun to realize the disadvantage at which they have been placed by these advancing strides taken by the German government. The British cruisers are going to be heavily armored on their upper decks with curved plates and will have a protection covering their funnels. They are also to have in their equipment, guns, which can be elevated to an angle of eighty degrees and powerful enough to throw a thirty-

AN AEROPLANE IN FLIGHT.

one pound shrapnel thirteen thousand feet in the air at a distance of four and a half miles. The French live in constant fear, as do the British also, of waking any morning to find the sky specked with hostile German air-crafts, of one kind or another, playing havoc with London, Paris, or other centers of population or supplies. All along the boarder line between Germany and France there have been stationed posts, equipped in some cases with nitrogen factories, showing both offensive and defensive tendencies on the part of both. Many nitrogen factories have been set

up in the interior for replenishing dirigibles. France, however, relied chiefly on the prowess of the aeroplane until comparatively recently, but have realized that the most important part of an air fleet lies in efficient dirigibles. Accordingly, by the end of this year, the French government will have in its service fourteen semi-rigid dirigibles. The French aerial war budget increased from $1,240,000 in 1911 to four million dollars in 1912, and, it is estimated, will reach eight and a half million for the coming year. Besides building these dirigibles, they are also having practice in sharpshooting at flying targets. This has been done, however, under unsatisfactory conditions as the targets cannot be drawn at a desirable speed. The practice has shown some very satisfactory results, but the effect upon a target going nearly sixty miles an hour can scarcely be prophesied from the results taken from the practice drawn at the rate of twenty miles an hour.

There is a general belief that the dirigible is a rather slow and heavy craft. This is decidedly not the case, as Germany is equipped with high-speed dreadnaughts. The *Z III*, for instance, built by Count Zeppelin for the government, has often attained the speed of fifty miles an hour, and there is a dreadnaught now being built of which the specifications require fifty-five. The largest airship ever built, the most recently constructed Schuette-Lanz, easily makes fifty miles per hour. Another year will, without doubt, see a sixty-mile-an-hour dirigible.

Besides having such great speed, these German air-ships are armored with a metal, the composition of which is known only to the government, that, though only a small fraction of an inch thick, can withstand any ordinary bullet. They will mount guns that will fire a small shell with force enough to penetrate a one-inch steel armor plate. This introduces another advantage of the air-craft. This is that the gunner in the air can easily see just where his shot strikes, and regulate his next one accordingly, as the aeroplane, to say nothing of the dirigible, is steady enough in its flight to use all modern scientific methods; and then, too, the pilot will circle about the target, using it as a center. Remarkable accuracy has been attained by using these methods. There is no possible way, at present, by which the gunner on the ground

can judge his shots at an air-craft, because of the lack of background.

By far the greatest terror that air warfare will introduce is that of bomb-dropping. This has become an exact science now, and the number of hits is becoming relatively great. This is almost entirely due to the Ceiss sighting instrument. However, it is not the high percentage of hits that is terrorizing as much as it is the character of the bombs that will be dropped. The Krupp Gun Factory is putting out a bomb that burns brightly during its flight and also after it strikes the ground. This does not only kindle fire where it hits upon an inflammable substance, but also gives sufficient light to enable the aerial gunners to see where they wish to shoot. Another bomb has been invented, for defensive use entirely, which explodes in mid-air, creating a large cloud of dense smoke that slowly sinks to the ground and renders the air-craft invisible to the gunners below. Another method of defense at night is that of hanging a light as much as five hundred feet below the craft, and in this way confusing the gunners on the earth. The worst bomb of all is one which, when it explodes, releases some hundred and fifty pounds of poisonous gases, killing everything within a hundred yards radius, and being effective for another hundred. The Japanese have employed the same principle in their defense equipment, and experiments have shown it to be practical. However, these bombs can, with the present facilities, be thrown only a little less than half a mile, so the force in the air can be comparatively safe at that height.

The Germans have planned and experimented with some very eccentric measures in their work of equipment. They have placed guns on several points of the hulls of their dirigibles;—in front, astern, amidships, and even on the upper deck. This will enable an attack on a ground force as well as an air force from any angle. These guns are so placed that in case the commander wishes to bring the heaviest possible attack upon a battleship, he will turn the ship down directly at the target, focussing every gun at it, and exposing the small circular surface of the front of the craft to fire, and easily turn the boat skyward again up to a safe height, much after the fashion of volplaning in a heavier-than-air machine. The Germans also expect to throw a sort of

bomb which explodes by a time fuse and sends out a shower of bullets, serving both offensively and defensively against aeroplanes. Another idea is to construct a large platform on the upper deck of each dirigible upon which to carry an aeroplane. The object is to send this aeroplane out on scouting expeditions or to fight duels with attacking aeroplanes or dirigibles in order to save, as far as possible, the more serviceable and more useful machine. However, by far the most important advantage in any air-craft is that it is easily possible to see at almost a glance the position and condition of the enemy and report any maneuvers on the part of either side. Aeroplanes can make observations and report approaching storms, which, as they are seldom more than a hundred miles in diameter, can be readily avoided by the larger and faster dirigibles. However, in critical periods of wars, weather will not hinder any attempts to carry out measures in an aeroplane. Life is a cheap commodity to a nation in a time of necessity, as is the aeroplane,—a hundred and twenty of which can be built and maintained at the cost of a single battleship.

There seems to be no limit to the destruction that can be done by an aeroplane and its attachments. If devastation is desired, by an aeroplane and its attachments. If devastation is desired, grain fields, or other suitable places, doing more damage than any company of infantrymen could do. Attempts to put the fire out could be arrested by sharpshooters or automatic guns. Hooks on the end of cables attached to aeroplanes in front of the incendiary one can turn over small frame buildings and drag them on to railroad tracks. Here the torch-trailer can set them on fire, and the heat will be quite sufficient to bend the rails, bringing famine to the cities for want of necessary transportation to bring in the food from the country, and to the country by burning the crops. The incapacity of the railroads will hinder attempts to flee from the havoc. Think what this means. Besides this, gas-tanks can be exploded, railroad terminals burned, and nearly anything and everything destroyed.

Immense dirigibles have an area of activity of from three to four thousand miles in diameter, and will be able to leave the actual scene of battle to attack outlying cities, one by one, threat-

ening them with cutting off their water supply, or applying the torch. Of course, the amount of supplies that can be carried by an air-craft is limited, but it could be replenished by exacting from the conquered.

It must be realized that air-warfare is a thing of the future, but that it is imminent. One cannot define its limitations as yet, but it is sure that the power having the larger air-ship will have the advantage in duel combats, and the one who attacks will be put at a disadvantage. It is also certain that the first blow in the next important international struggle will be struck through the agency of the air-navy.

# POTASH DEPOSITS IN AMERICA

*W. C. Schmidt.*

IT is well known that potash salts are absolutely essential to the complete fertilization of the soil in which modern agriculture is conducted. For years, Germany alone has mined sufficient of these salts to supply the world's demand, thus creating a monopoly which has raised the prices beyond all legitimate commercial profit. When the German government itself attempted to regulate her own price on potash, the United States interfered, and, with all science at her command, endeavored to discover a method of escape from such oppression. Many believe that this release has been attained in the discovery by the United States Geological Survey of extensive deposits of potash in the vast phosphate areas of the west.

These potash beds, which have been known to scientists for years, have not previously been considered of economic importance, but merely of geological interest. Collectively the deposits cover a broad area, including the state of Idaho, Montana, Wyoming, and Utah.

A great many rock-types, such as the granites and feldspars, which form a considerable portion of the earth's crust, are known to contain large amounts of potash, but unfortunately they are insoluble and hence unavailable in this form for fertilizers. In the leucite country of Wyoming, however, there is a potash-rich rock from which it is hoped to obtain, by some chemical process, the available salt in commercial amounts. According to a conservative report of the Survey, there is available in this region about two billion tons of leucite rock, all of which is above the surface level and contains about ten per cent of potash ($K_2O$). The value of the deposits, however, must depend upon some feasible plan for the extraction of the valued constituent.

Several companies have been formed which claim to control a process for recovering the potash, but the practicability of the methods is still doubtful. The extraction of the potash would involve a separation from at least three minerals, namely: leucite,

phlogopite and sanidine, and unless this could be done cheaply on a large commercial scale, the enterprises might easily be thwarted in their work by the German producers, who are now selling high enough above the cost of production to reduce the prices and still retain considerable profit.

The Leucite Hills of Wyoming, where the main deposits lie, are located in the Rock Springs coal district. They are a curious formation which is peculiar to the region and has apparently been constructed by a recent, restricted volcanic flow or capping which deposited the lava here and there in large table-lands or "mesas", as they are locally called. One may better judge of the character of their appearance by glancing at a few of the names, among which are "Boar's Tusk", "Badger's Teeth", "Pilot Butte", and "Steamboat Mountain". The largest deposit, known as "Zirkel's Mesa", contains more than 104,000,000 short tons of pure $K_2O$; "Steamboat Mountain" nearly 20,000,000, and "Black Rock" about 16,000,000 more. It is interesting to note in this connection that, with a practical method of reduction, the Leucite Hills, alone, would produce enough potash to supply the American farmers with fertilizers for several hundred years.

More of the leucite rock which was not included in the government report is found imbedded in dikes, associated with volcanic necks, and also in seams, like coal, between layers of shales and limestones.

The lavas of which these hills are formed are of an unusual and exceptional type. They are all so very fine-grained that, to the naked eye, they appear rather earthy. The rock material consists of minute reddish brown mica flakes and varies in color from a dull reddish or yellowish gray to a straw color. The leucite itself can only be seen by the aid of a microscope. Nine analyses of the rock material have been made, five of which show more than 11 per cent of $K_2O$, the highest being 11.91 per cent, and others lower, bringing the average to about 10.74 per cent.

Assuming that the leucite industry eventually becomes a success, it is fortunate that the deposits will lend themselves readily to transportation, for the Union Pacific Railway crosses the area and feeders from some of the "mesas" may be run down to the main line under the impulse of gravity. Their nearness to the

large copper smelters may also prove of great importance, for those plants produce great quantities of sulphuric and sulphurous acid fumes which are usually allowed to go to waste through the smoke stacks, and which may possibly offer a means of phosphate reduction by acid reaction. If this can be done, it will prove to be one of the largest commercial uses for these waste products of the smeltories.

No final patents have been granted by the United States government to any of the leucite lands except in sections within a distance of twenty miles of the railroad which accompanied the company's original grant. Many thousand acres have been withdrawn as phosphate lands and the government is constantly guarding against any attempt to monopolize this new industry which, when a practical reduction of leucite rock is perfected, promises to yield enough potash to retain the fertility of American soil, to relieve the United States from the appressive German monopoly, and to furnish many tons of potash for exportation.

# THE EFFICIENCY OF THE MOTOR TRUCK

*Harold L. Wadsworth.*

IN the long line of inventions none has so sensationally and rapidly influenced the life of a nation as has the automobile. The pleasure automobile was the forerunner of another development—the motor truck—which has to a great extent made itself felt upon the whole fabric of national commerce and traffic. The passenger automobile has been condemned as a luxury and praised as an influence to good roads and as bringing the farmer out of isolation. However, in the last few years the motor truck has come into prominence and has become a large portion of the automobile industry. The motor truck places its claim to such progress entirely upon utilitarian grounds.

The progressive business man considers the dependability, speed and capacity of more importance than the saving of transportation costs. This fact has been proved many times, by the steamship superseding the sailing-vessel, the railroads the stage, the telephone and telegraph the messengers and mail. The motor-wagon is recognized as an asset in the upbuilding of business, increasing the territory which can be served, and winning the respect of customers by prompt, quick and certain service.

The motor truck has many advantages over the horse-drawn vehicles. For one, it means cleaner streets. The horse as a purveyor of filth, which serves as a breeding or culture medium of flies and noxious germs, is doing more than any other agent to prevent the proper sanitation of cities. Horses are the chief source of street filth, so when horses are dispensed with, the cost of street cleaning will be greatly reduced. The oil which drips from machines onto the pavement, once considered as injurious to asphalt pavement, is now recognized as an allayer of dust, and hence a hygienic factor of value.

The rapidity of service is greatly increased and a wider radius of delivery is obtained by the use of the motor truck. The horse and wagon—a single horse with a one-ton wagon—averages between four and six miles per hour, while the average one-ton

truck is capable of going between eighteen and twenty miles per hour. The average per diem for a one-ton truck is about eighty miles, for a five-ton truck about fifty miles and for a ten-ton truck about thirty-eight miles. The advance in speed which the motor truck has brought about brings the urban communities so much closer to the cities. A motor vehicle is able to make a delivery ten miles from the store in nearly two hours less time than a horse-drawn vehicle. It is a great advantage to the merchant to have his delivery service thus benefited.

Motor truck service is more to be depended upon than the horse and wagon. The effect which the weather has upon the horse in no way affects the motor trucks. In winter the deep snows and glassy pavements limit the functions of the horse. The power vehicle, on the other hand, has only to attach skid-chains to its wheels and it is ready to do its usual duties. The only disadvantage of the power vehicle in winter is the freezing of the water in the radiator, and this can be easily obviated by carefulness of the driver. Much less does the boiling heat of summer affect the power vehicle. When heat brings down the normal efficiency of the horse, it causes delays in deliveries which inconveniences the customers, and if the goods are perishable, costs the merchants thousands of dollars loss. Not so with the power vehicle; it will give just as good service on the hottest of days as it will on the coldest.

The increase in speed which the power vehicle brings about is a great factor in decreasing the congestion of traffic. The increasing density of traffic on the streets of large cities will be relieved by the supplanting of the motor truck for the delivery wagon. Utilization of power wagons would bring about prodigious economy in available street capacity, for one motor truck does the work of three horse-drawn vehicles and occupies thirty per cent less space in the street. It is estimated, if the motor trucks were used entirely, that three times the present volume of traffic could be accommodated before relief measures would be needed.

Looking into the future, the power wagon advocates see the passage of ordinances in New York, Chicago, and other large cities, prohibiting the use and stabling of horses in congested cen-

ters. They allow the horse five more years of existence. Have not the automobiles and taxicabs almost driven from the street the carriages and cabs? It shall be the same with the displacement of the work-horse, only the rate will be greater.

The economic change is almost as great as the single item of transportation. It has often been said that it was only after improved machinery had made slave labor unprofitable that there arose a great popular wave of protest against slavery; and, therefore, it was to mechanical invention that myriads of blacks first owe their freedom. Whether or not this is true, it is certain that the horse owes its decreasing activity in the toils of town to the invention of machinery that hauls farther, faster and cheaper than the horse.

In the cost of maintenance, operation, repairs, deterioration et cetera, the motor trucks are much more economical than horse outfits. Records obtained from department stores, express companies, coal dealers, breweries, etc., have proved this fact many times.

The cost of operation of a gasoline truck is composed of nine distinct and separate items. The first group is made up of four items—insurance, interest on investment, drivers' wages, and garage charges—which are nearly constant in trucks of equal or similar size. The second of operating cost items consists of gasoline, oil and depreciation. Depreciation might be placed in the first group; a figure of 15 per cent is conservative for the annual depreciation. The third comprises tire maintenance, and machine overhauling or up-keep.

The cost of operation and maintenance of the different sizes of commercial cars is of great importance to the average business man. This is especially true with the men who are contemplating replacing their horse-drawn vehicles by the motor-driven type. The manufacturers are fully cognizant of the fact and have collected records of their machines used in different trades in widely separated communities. From these records they have calculated average running expense, including actual running expense and overhead costs. In obtaining these averages it has been necessary to determine wages for chauffeurs, cost of gasoline, average

insurance et cetera. The daily average of the gasoline truck is as follows:

| | | | | | |
|---|---|---|---|---|---|
| Light wagon, | averaging | 70 | miles a day | ...... | $ 6.10 |
| 1-ton truck | " | 70 | " " " | ...... | 8.07 |
| 2-ton " | " | 70 | " " " | ...... | 10.60 |
| 3-ton " | " | 62 | " " " | ...... | 12.20 |
| 4-ton " | " | 55 | " " " | ...... | 13.80 |
| 5-ton " | " | 50 | " " " | ...... | 15.00 |
| 7-ton " | " | 45 | " " " | ...... | 16.45 |
| 10-ton " | " | 35 | " " " | ...... | 18.50 |

It costs, according to the statistics of a number of large business houses, over $8 a day to keep a wagon and a team of horses at work, including the salary of the men. Yearly this would amount to $2,920. Taking an average from the daily cost of motor trucks from the above figures, the cost per day would be $12.59, amounting to about $3,800 per year. It is interesting to notice here that on Sundays the truck, while standing idle, impairs no expense, excepting interest on the investment and storage, while the horse must be fed. However, the average truck, costing $12.59 per day, accomplishes the work of five two-horse teams. The up-keep of these would be about $45 a day. Compared with this the economy of the motor truck is obvious.

To-day the motor truck is being used in one hundred and twenty-five distinct lines of trade, and its adaptability in other fields is constantly being shown. Practically every industry and business in which transportation is necessary has been invaded by the horseless wagon. The Government has authorized the purchase of 1,200 trucks to replace the mule teams in the commissary department. In several large cities motor-driven street cleaning machines have appeared. The motor wagon is being used in the mail service and is growing in popularity since the installation of the parcels post. Even the funeral car has been motorized. From data recently collected it has been shown that in 301 cities there are 594 motor-driven fire-vehicles of all kinds now in service. Thus the motordriven vehicles are not being used in transportation alone, but in many other lines.

The manufacturers of motor trucks sometimes receive reports that their machine is not giving satisfactory service. Most all

of these failures in recent years have been traced to two causes, misuse and improper care. Overloading and overspeeding are the most serious abuses which the motor truck has to stand and for which the manufacturers are blamed. Truck-users very often overload their machines from 50 to 100 per cent, and then drive them at full speed. The manufacturer can in no way prevent overloading, but many of them are now placing sealed up speed-governors on the motor to prevent speeding. Careless drivers can in many other ways injure the machine so the results will not be satisfactory, but this is no fault of the manufacturer.

Motor trucks and motor trucking have emerged from the experimental state. They have proved their case. Companies that were among the first to buy and use the motor truck are the best buyers of them to-day. The users of motor-driven vehicles realize their efficiency, that they give faster and more reliable service, that their installation means a distinct saving. The motor truck means for the city, cleaner streets and less congestion; for the rural districts, a service which is beyond the radius of the horse-drawn vehicle. It is very apparent that the motor truck is not a benefit merely to the users, but to the entire country.

# SCIENCE NOTES

CONDUCTED BY A. B. REEVE.

## AN ECONOMIC COAL MINING SYSTEM

*W. F. McLean.*

IT has been estimated by the United States Bureau of Mines that the amount of waste in mining of coal in this country is at least one ton for every ton of anthracite taken out; and for every ton of bituminous coal extracted the waste is one-half of a ton. The crude coal mining systems employed in the past have not only involved great waste, but they have been the cause of much disaster, both distressful and costly. To alleviate these conditions, the Hoadley-Knight Coal Mining Company has developed a system of mining coal by machinery. Aside from the fact that the system and the machine itself provide an improved and economical way of mining coal, it has attracted considerable attention because it points to a new method of transportation and consumption of the bituminous fuel.

The process includes as its most important unit a machine provided with electrically operated rotary cutters, which cut the coal into a granular or powdered form, very much as a circular saw cuts wood. The motor used for power has, in addition to its forward movement, a sideways swinging motion, which can be adjusted to certain angles; thus the proper width may be cut. At the end of each lateral stroke the machine automatically goes forward one inch, more or less, as is desired, whereupon it immediately begins its return lateral swing. While the rotating parts of the mechanism are electrically operated, the forward motion is directed and controlled by a hydraulic motor, so that while the cutting movements are rapid, the feeding movements are slow and powerful.

The machine possesses the added advantage of being mounted on tracks which are carried with it, since it has shoes which are automatically advanced with its progress. This system is superior to an outfit on wheels, since the latter is apt to cut up the floor too much, for most coal mine floors are more or less soft, especially when wet.

While the coal is being cut, a powerful stream of water is made to play upon its surface. This serves as an aid in breaking down the coal and has the further effect of loosening the coal at the floor and roof which may be beyond the reach of the machine. The water also prevents dust formation, keeps the tools clean

THE NEW COAL MINING MACHINE.
*Courtesy The Hoadley-Knight Coal Mining Company.*

while cutting, and prevents explosions in the mine. The same stream carries the coal away to a "sump", from where the mixture of coal and water is pumped to any desired location by means of an electrically driven centrifugal pump. The mixture is then forced through pipes to its destination, where the coal is allowed to settle, whereupon the water, which is left practically pure, may be drawn off. The coal is then ready for coking or fuel.

In this method of transporting the coal by pipes, the loss is very small, considerably less than one and one half per cent; whereas

in railway, or canal, transportation the actual loss is at least ten per cent. The water in no way operates to injure the coal as a fuel product; quite the contrary, for it is a well known fact that coal, especially crushed or powdered, when moistened before firing, makes a much superior fuel.

That the coal milling machine is efficient is evident from the fact that it will drive a cutter 200 feet in one day, and its capacity for cutting is from 100 to 250 tons a day. Owing to its advancing directly into the coal, the machine will cut a slope, an entry, a room, or work along a wall. By cutting narrow rooms and leaving narrow pillars, timbering may be largely done away with. Hauling is eliminated by the adoption of the hydraulic transportation system; and the coal milling machine makes the use of explosives unnecessary. With all these material advantages, the Hoadley-Knight system is bound to revolutionize coal mining in the near future.

The general introduction of this machine, and the adoption of the new method of transportation in connection with it, will greatly benefit the coal mine owners and operators, and will bring into the market coal properties which by reason of their great distance from shipping facilities remain not only undeveloped, but seemingly of little present value.

# THE AUTOMATIC FIRE SPRINKLER

*William Seymour.*

WAREHOUSES, mills, and plants of various kinds that contain a large amount of valuable goods need the very best there is in fire protection. In fact, it is so vitally important that, unless such protection is secured, a firm cannot do business because of the handicap. The insurance rates on unprotected buildings of this type, where huge quantities of inflammable materials are stored, are very high. However, if the protection of an automatic sprinkler system is adopted, extremely low rates of insurance can be secured. How important these low rates are can readily be seen when one considers that there is often several million dollars worth of goods which have to be covered by insurance in a building which in itself may only be worth $150,000. If the rate is high the *entrepreneur* must stand the difference, as competing concerns probably enjoy the low rate, which permits them to make their bids so much lower. That the insurance company is justified in extending these low rates, if the automatic sprinkler is used, may be seen from the records of the National Fire Protective Association. Out of 10,356 fires that have occurred in buildings equipped with the automatic sprinklers, 64 per cent were put out by the action of the sprinklers alone. Of the remainder, 31 per cent were held in check until the fire department or other aid arrived, and most praiseworthy of all is the fact that only 5 per cent got beyond control of the automatic system. Furthermore, upon investigation it was found that out of the 5 per cent that proved fatal, in 22 per cent of these cases the water supply had been shut off either by neglect or carelessness. In 23 per cent of these failures, the cause was due to defective systems, or ones that were incomplete in some essential detail. Moreover in 5 per cent of the cases, the trouble was due to poor water distribution. Faulty building construction was the reason for failure in another 4½ per cent. From this remarkable record, the thoroughness and efficiency of this system can be seen. It is also safe to prophesy that with proper building construction, a

complete modern equipment, provided good care was given it, would prove almost infallible against an internal fire.

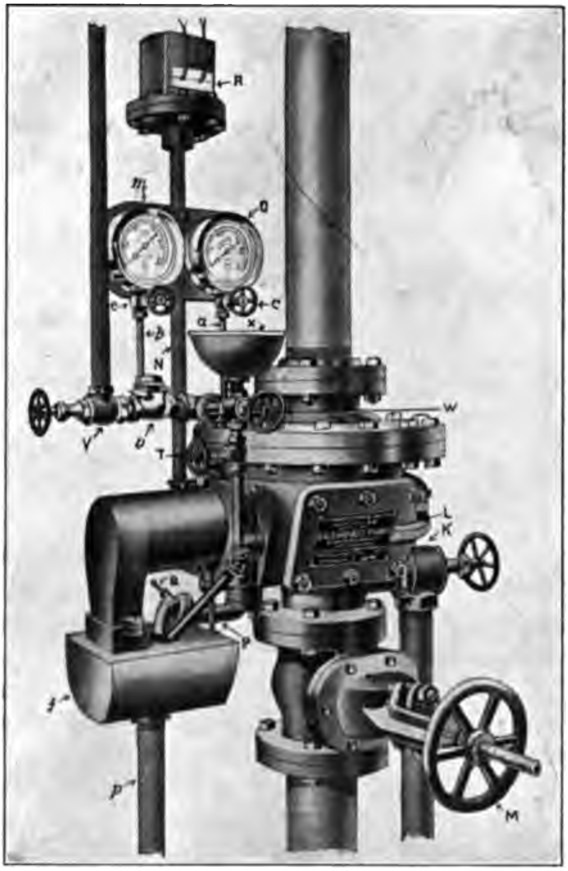
An automatic sprinkler system consists of a series of pipes all connected together and fed by supply pipes, which in turn are connected to house mains. The whole system is coupled to a large rotary pump which is the heart of the plant and furnishes the power to force the water through the heads on to the fire. The pipes conveying water to the fusible sprinkler heads are so spaced on the ceiling of each floor of the building as to permit the throwing of water on every square foot of floor space. Generally these heads are placed at eight or ten-foot intervals.

It is really these heads, which will always open at the right time, that are the crux of the whole system. The cap, or plug, which closes the outlet of the head, is held in place by means of a fusible strut which, when the heat of the room rises sufficiently high, melts, letting the water out onto the fire. The heads have water deflectors which throw the water on both the ceiling and floor. One plug will generally take care of sixty-five to a hundred square feet of floor space. The fusing point of the heads can be predetermined at will by changing the composition of the strut. They are made, at present, suitable for various needs, to fuse at 130 up to 400 degrees Fahrenheit. In factories where acids are used, it is necessary to adopt a certain kind of plug which is acid proof. In this case the efficiency, or fusing ability, is in no wise injured.

In unheated buildings water cannot be left in the pipes in winter as there is great danger of freezing, which makes the entire system inoperative. Therefore, it has been necessary to establish two systems, the wet and the dry. The dry is the one that is used in unheated buildings, and the wet in other cases. The dry system is not as efficient or as quick in getting water to the fire as is the wet, because here the pipes are filled with air under considerable pressure. This compressed air in turn holds a dry valve closed which acts as a water gate. This dry valve must be situated in a location where there is never the least danger of freezing. This plan works in the following manner: When the heat becomes sufficient the fusible head melts, letting the air rush out, which removes the pressure on the dry valve, permitting it

to open. Then the water under pressure follows, and finally gets to the fire. The disadvantages of this system are:

1. The water is slow in reaching the fire, and this at a crucial moment when the fire is getting under way.




DRY PIPE AND ALARM VALVE.

2. There is trouble in keeping the air pressure in the pipes constant, which is essential, because if this pressure falls the dry valve will be "tipped", letting the water into the pipes.

3. The dry valve itself is a troublesome thing, because it is very delicate and liable to get out of working order easily. How-

ever, with all its faults the dry system is vastly superior to any other means of protection, except the wet system, a fact that is recognized by all insurance companies. Whenever it is possible to use the wet system it should be adopted, as it is superior to any other.

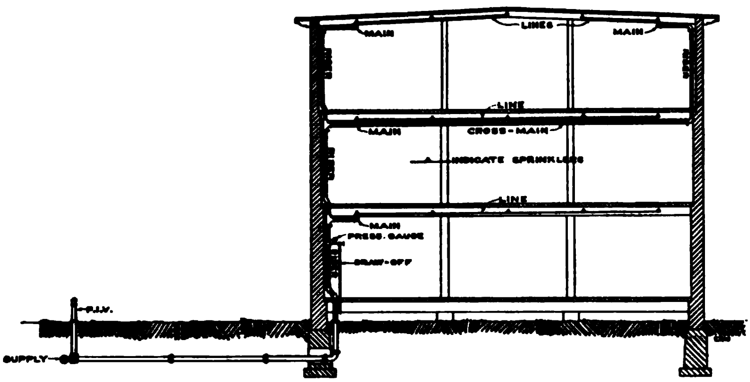
There is quite a variety of ways of supplying the water to these systems. Gravity tanks, city supply, and fire pumps are, perhaps, the methods most often used. It is essential that there be two sources of water supply acting independently of each other. Let one be considered the primary source and the other the secondary. The primary source should be a gravity tank, as by this method an immediate supply under pressure is available. The secondary supply should be either a special pump or the city supply. When the primary or automatic supply is exhausted the secondary can be turned on and thus supplement the tank. Prime requisite of gravity tanks are a good supply and a high elevation.

Three materials may be used in the construction of the tank, all of which fulfill the underwriters' specifications. These are concrete, wood, and steel. Where a high initial pressure is desired it is necessary to use a steel tank in connection with compressed air. The tank, which should be given a considerable elevation over the highest floor in the building, is made of steel plates, filled about three-fourths with water and the rest with air under a pressure of 75 to 100 pounds. This insures the water being delivered out of the plugs at a high velocity on the top floor. Of course the ground floor does not need the aid of the air pressure, as here the force due to gravity is more than ample in a high building. For ordinary purposes the concrete or wood tank is used, and found to be effective. Tanks should be of sufficient size, the size depending on the building and its proximiity to outside aid. They range from 10,000 gallons to 100,000 gallons capacity. The bottom of the tanks should be at least 24 feet above the ceiling of the top floor. Any additional elevation is an advantage.

Fire pumps form the best secondary source of supply. They should be isolated from the building, and protected on all sides by concrete walls, so that their effectiveness may not be hampered either by the heat or falling debris. These pumps should never

be of a smaller capacity than 500 gallons per minute. Pumps of the 10,000 gallon size are more generally used and found to be the best. Greater capacity than this is best obtained by additional units rather than a single pump. The pumps ought to be made of a non-rusting material. Hitherto, steam power for operating the pump has been largely used, but this is much inferior to an electric motor. The faults of steam are: (1) The necessity of always having a constant steam pressure on hand; (2) Disturbances within the building in time of a fire may injure the boiler apparatus, thus putting the fire pump out of commis-

ELEVATION OF AUTOMATIC SPRINKLER SYSTEM.




sion; (3) The fire is liable to make the boiler room inaccessible. Now, the electric motor has obvious advantages. In the first place its source of power is from an external plant, which cannot be harmed by the fire. Secondly, it is more easily controlled than steam. And, thirdly, it is always and instantly ready.

Evidently the size of the pump depends primarily on the number of sprinkler heads and the amount of water delivered to each per minute. Generally a discharge of twelve gallons per minute per head under a five-pound pressure is desired. If twenty gallons are needed the required pressure is ten pounds. The pressure meant here is not static, but flowing pressure; the difference being that the static is necessarily the greater because the friction

developed internally in the pipes lowers the pressure when the water is flowing.

Oftentimes one hears about the damage due to water being greater than that due to the fire itself. This frequently is true, and to prevent it, some way of announcing that the system is in operation should be installed. This is easily accomplished by placing an alarm valve in connection with the system. This causes a bell to be rung in several parts of the building, as well as at the police or fire department headquarters, thus insuring someone's preventing unnecessary loss due to water. In order to obtain the best results, both an electric and water signalling motor should be used. All electrical connections need to be well guarded.

In putting in a system of this kind great care should be exercised, especially in old buildings. Here the faulty construction equation enters very largely, unless extra precautions are used. The main trouble that is likely to occur in old buildings is that some portion of the floor space will be out of reach of the sprinkler heads. Furthermore, to secure satisfactory results all work should be under the supervision of a competent engineer. This insures the use of right sized pipes, tanks, etc. Moreover, it is necessary to have the pipes leading to the heads large enough, but not so large as to use more water than necessary, as this will interfere with the proper distribution of the water.

Sprinkler systems are not cheap; on the contrary they involve a large expense. For example: In a certain warehouse in Chicago of the mill construction type, containing about 150,000 square feet of floor space, estimates were made ranging from $15,000 to $20,000 to install such a system in this building. This is about ten per cent of the value of the property. Perhaps the greatest reason for the excessive prices charged in this kind of work is due to the business being practically controlled by a monopoly. However, the difference saved in insurance rates makes it imperative that an automatic sprinkler system be installed in all buildings of the factory or warehouse type. In most cases the amount thus saved will pay for the system in three or four years.

THE 1913 BOARD.

CLYDE MARTIN. T. M. PRUDDEN.

H. D. SCHMIDT, *Bus. Mgr.* F. D. VAN SICKLEN (*Chairman*). A. B. REEVE.

# BOOK REVIEWS

CONDUCTED BY CLYDE MARTIN.

*Storage Batteries. The Chemistry and Physics of the Lead Accumulator.* By Harry W. Morse, Ph.D. The Macmillan Company, New York, publishers. Price $1.50.

This small volume is admirably arranged and written. It is difficult to see how greater clearness in presenting an important subject, far from simple in itself, could be attained. The Chapter XVII, "Some Commercial Types", is of interest even to one not a student of either physics or electrical engineering.

*C. S. Hastings.*

*The Spirit of the Town.* By Tod Robbins. J. S. Ogilvie Publishing Company. $1.00 net.

This intensely interesting book is written for a purpose. Its author is a man who shuns conventionality, and who does not fear to speak frankly. In this book he shows in a very vivid way the high degree of commercialism which exists in a big city such as New York. Commercialism and the vain desire for wealth and show overshadow everything else and crowd out all ambition and good traits in man.

*The Spirit of the Town* shows how a young man with fine literary talents and ambition goes to New York and is soon caught in the grasp of the city, where he readily falls into the spirit of the town to the sacrifice of all his talent and ambition. He caters, against his finer instincts, to the glitter of gold and the readers of cheap, love-sick fiction.

Several other characters are developed which show the various types characteristic of a big city. These range from the bloated, lazy heir of a large fortune to the gambler in stocks who ruins a young bank clerk. The characters are not unusual ones, but are

those which are easily found in any large city. The wealthy heir who has nothing to do but spend his father's money, spends his time at the club and at night takes his mistress to shows, cafes, etc., until even this becomes a bore to him, and he throws the girl over, after ruining her, in order to find some fresh amusement in the form of weak flesh which his money can buy. The foolish, young bank clerk, whose sole ambition is to live like a lord and have a mistress, is led to his death through dissipation and dishonesty. The typical man about town, who knows everyone and all the ins and outs, is worshipped by the young aspirers to fortune whom he easily leads downward to sin, vice and shame.

Mr. Robbins has not drawn all his characters in the negative. He introduces several who have an ideal and who remain true to their ideal through poverty and even starvation. These characters are beautifully drawn. The poet who renounces fame and wealth by refusing to cater to the fickle mind of the masses at the sacrifice of his art, finally dies in utter poverty, but content and happy, for he had remained true to his ideal and would reap his reward in heaven.

The gentle socialist, who bears the weight of the world on his shoulders is a character which inspires one with the love for mankind.

The book is well written and intensely interesting. It characterizes hate in its most awful form, to love in its most gentle and beautiful form. There is no doubt that this age is becoming dangerously commercialized. Here is a young author who has taken upon himself to expose and criticise our modern civilization. He has a big task before him. We hope that Mr. Robbins will remain true to his ideal, in which case, the world is yet to hear a great deal more of him.

*C. M.*

The Yale Scientific Monthly wishes to acknowledge the receipt of the following books, which will be reviewed at the earliest opportunity:

*Malaria. Cause and Control.* By W. B. Herms. The Macmillan Company. $1.60 net.

*The Fitness of the Environment*. By L. J. Henderson. The Macmillan Company. $1.50 net.

*An Introduction to the Mathematical Theory of Heat Conduction*. By L. R. Ingersoll. Ginn & Co. $1.60 net.

*A Course in General Chemistry*. By W. McPherson. Ginn & Co. $2.25 net.

*The Economic Utilization of History*. By H. W. Farnam. Yale University Press. $1.25 net.

*Electricity and Magnetism*. By R. H. Hough and W. M. Boehms. The Macmillan Co. $1.10 net.

*Volcanoes. Their Structure and Significance*. By T. G. Bonney. G. P. Putnam's Sons. $2.00 net.

# ALUMNI NOTES

CONDUCTED BY T. M. PRUDDEN.

'54—This class is the oldest class of the Sheffield Scientific School which has any living graduates. There are two survivors: Professor Rafeal Espinosa Escallona of Bogata, Colombia, S. A., and Alonso T. Mosman, U. S. Geodetic Survey, Washington, D. C.

'02—The engagement of Miss Gladys A. J. Pell, the daughter of Mr. and Mrs. Howland Pell, to Mr. H. Pendleton Rogers, a son of the late Mr. and Mrs. H. Pendleton Rogers of Tuxedo and New York, has been announced.

'05—The engagement of Raymond Havemeyer, son of William F. Havemeyer, and grandson of ex-Mayor William F. Havemeyer of New York, to Miss Virginia K. Case, of Denver, has been announced.

---

MAY, 1913

# The Yale Scientific Monthly

VOL. XIX

No. 9

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. MAY, 1913. No. 9


FATIMA
TURKISH
BLEND
CIGARETTES
Cameron & Cameron Co
RICHMOND VA
GOLD TIPS
FINEST QUALITY

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. MAY, 1913. No. 9

## EDITOR'S NOTES.

### THE YALE SHEFFIELD MONTHLY

IN 1894 the YALE SCIENTIFIC MONTHLY was founded by seven members of the Senior Class. It was intended at first to be a purely technical magazine. Soon, however, it was found that an undergraduate publication could not exist on these grounds—it could not compete with the scientific and technical magazines of national repute, which have vastly greater resources than any college periodical could possibly have. Accordingly, the field of the magazine was enlarged and the main feature became a department called "The World at Large", which dealt with current events of the world. This venture, however, underwent the same experience as the previous one. It became evident that competition with professional publications was impossible.

At length, the 1912 board, realizing that the true field of the MONTHLY lay in Sheff itself, initiated the policy of attempting to represent Sheff and to voice Sheff opinion on all questions. From this time the YALE SCIENTIFIC MONTHLY ceased to be a scientific magazine in anything but name. The 1913 board continued and expanded this same policy. It has been thought for some time

that the MONTHLY has been laboring under added difficulties because of the false impression likely to be conveyed by its technical name.

The 1914 board has now decided to take another, perhaps to some people, a radical, step in the evolution of the paper. Beginning with the October issue, the name of the magazine will be changed to THE YALE SHEFFIELD MONTHLY.

This change has been impending for a long time, and after considering the matter in all its aspects, the 1914 board has decided unanimously to make the change. During the next year the Board will strive to publish articles which will be of interest to all Sheff men. It will endeavor to voice Sheff opinion on all University subjects. And above all, it will direct its efforts toward the upbuilding of the SHEFFIELD MONTHLY, and will attempt to bring the magazine to its proper place in the life of Sheff in order that it may develop into a publication typically representative of Sheff.

In our attempt to voice accurately Sheff sentiment on the important University questions which may arise, we reiterate the invitation of former boards to all men to contribute communications which, if on Sheff matters, should naturally appear in the Sheff paper, rather than in any other publication of the University or of any other department. Our goal will be to see Sheff on an equal footing with Academic in all University activities. If we can aid in the attainment of this goal in any way whatsoever, we shall feel that our labors have been well repaid. We frankly ask for the support of every Sheff man. It is your own paper. Give it your financial support, if possible, and if not that, at least your moral support. Our object, then, is to make the YALE SHEFFIELD MONTHLY a magazine which shall really represent Sheff and her sentiments. With this in mind, we shall strive to make Sheff's only periodical worthy of her.

* *

## A FRESHMAN DORMITORY

ONE of the principal objections that is always raised against Sheff is the fact that the present system of allowing the Freshmen to room in the various small boarding houses makes it very difficult for them to become acquainted with their classmates. The average Freshman lodging house will hold from ten to twenty students only; thus it is obvious that while the men in one of these houses soon get to know each other very well, it is next to impossible for them to form a very extended range of acquaintances among the rest of their class. The men coming here from the large preparatory schools all over the country form separate and distinct units, the general tendency being for men from the same school to room in the same boarding house and more or less isolate themselves from the rest of the class. This tendency, while a very natural one, operates greatly to the disadvantage both of the individual man and the class as a whole.

There is obviously but one remedy for this very unsatisfactory state of affairs—a Freshman dormitory. We now have two handsome dormitories in the Senior and Junior wings of the Sheffield Vanderbilt Hall. The University owns the property on the north and east sides of the square on which these dormitories are situated. Thus there is ample space for a new dormitory in which to lodge the Freshman class. Such an addition would benefit Sheff in two ways. First it would give us a Campus, the need of which has long been felt, surrounded by dormitories. It would also furnish a solution of the problem of lodging the Freshmen. They would become better acquainted with the other members of their own class, would be less inclined to segregate in cliques, and would form a united whole.

This plan already has the endorsement of many members of the Sheff faculty, who realize the difficulty of dealing with the Freshmen under the present system. Let us hope that some such plan will soon be adopted and a long-felt want fulfilled.

* *

## A BYERS HALL GRILL

BYERS Hall has already been much improved this year by the addition of a first-class barber shop. Men are now enabled to get a hair-cut or shave between recitations, and are not obliged to go down town for that purpose. The barbers have been well known to college men for years, and the presence in Byers Hall of a branch of their shop fulfils a long-felt want.

However, there is still much room for improvement in Byers, along one line at least. We think that a grill should be installed there, similar to the one which is maintained in Dwight Hall. At present the only place in the building where one can get anything to eat is a "dog", which is operated in cramped quarters by an outside firm. Every Sheff man has experienced the discomforts of standing, jammed in with a crowd of other men, on some morning, in an almost hopeless attempt to get some breakfast before an eight or a nine o'clock recitation. Think how much better it would be to have comfortable tables, plenty of room, and a greater range of variety on the menu. The quarters that the lunch room is now situated in are very inadequate and unworthy of such a fine building. Let us have a grill in Byers Hall!

* *

## THE YALE AERO CLUB

SOME time ago a club was formed in Yale which offered much promise of future usefulness. We refer to the Yale Aero Club, which last year conducted a very successful exhibition. This is an age of progress along all lines and it truly seems as if Yale University should be in the front rank. Unfortunately, the Aero Club has apparently died down. We cannot recall any activity on the part of the club during this college year. Now a club devoted to the study of aviation has a place in a University of the type of Yale. It is more than likely that in the future most people will be using some sort of aerial craft or other. Al-

though this may be a long time off, we should be prepared. The Club is too valuable to die through neglect. It seems as though some action should be taken to stir up the lacking interest in this organization.

* *

## A YALE THEATRE

YALE has recently received from some anonymous graduates a gift of a piece of land, which is known as the Hopkins Grammar School property. The Corporation, upon accepting this gift, assured and practically guaranteed that a theatre should be built upon it, as well some other buildings. A Yale theatre would be very advantageous to the Dramatic Association, for it would indeed augment their activities. At present, the Association presents only a smoker and two plays—the Prom. play and the Commencement play. Such a theatre would enable the Association to increase the number of plays given; and if we may suggest it, without breaking another tradition, perhaps the undergraduate body might be allowed to show their ability in the röles of a musical comedy. This would indeed be an innovation, but as anyone taking an initiative step or even suggesting one is being, at present, so grossly criticised, we fear the suggestion may mean our damnation. However, to return to the theatre, we may say that the greatest difficulty in producing more plays is the expense, chiefly that of renting a suitable theatre, for the Association has considerable stage property and costumes of its own. If the plan for building this new theatre is carried out, it will do away with this chief obstacle and also will create a place suitable for other affairs, which at present have no such place and must resort to buildings other than those of the University. Aside from that standpoint, this new theatre will give an opportunity to a great many more men of displaying their talent. Some of the lesser talents may be trained into most proficient actors and short plays from the pen of an undergraduate may be given a trial. Under the existing conditions these things are impossible. The practicability and wisdom of this plan seem assured and we hope that it will be carried out.

## THE PROFESSOR

PROFESSOR Henry S. Canby, in his recent article entitled, "The Professor", which appeared in the April issue of *Harper's Magazine*, has set forth a very strong defense of the college professor. This latest work of Professor Canby's is—if such indeed would be possible—even better than his previous article on the undergraduate. Aside from its very admirable literary merits, of which we hardly feel capable of judging, "The Professor" is bound to attract a great deal of attention throughout the country. While it is extremely interesting to every reader, whether or not he may have any interest in college work, Professor Canby undoubtedly wrote primarily for those parents whose sons are now undergraduates in any of our universities or intend to be such at some future time. To such parents this article ought to be of inestimable value.

The greater part of the article is taken up with a very strongly presented plea both for a better recognition on the part of the community as a whole of the true value of the college professor and for a fuller coöperation between the parents of the undergraduates and the professors. The problems with which the college professor has to deal are stated in an admirably straightforward manner. Professor Canby from his long years of experience on the English faculty of Yale University, is certainly in a position to speak with authority on this subject. His opinions deserve a great deal of respect and ought to carry weight even with the practical business man whose son is, as the average father expresses it, "having a few years of good times at college."

It is probably true that the average American looks upon the college professor as an extremely dignified individual with a "mysterious interest in subjects of no earthly use to anyone." This opinion is, we believe and hope, gradually becoming extinct and the true value of the professor is becoming more apparent to the community. In any case, "The Professor" will certainly do much to accomplish this happy result. No intelligent reader, after perusing this article, could still retain the belief that the professor "looks through steel-rimmed glasses on a world that

does not concern him." He must not only be respected for the wide range of his knowledge, but also be regarded as a most important factor in our economic system. He has a very important work to accomplish and can accomplish it only with the coöperation and aid of the community. It is the community that suffers most from lack of its true appreciation of the professor.

Americans will go far toward relieving the burdens of the professor when they realize that after all he is not so very different from other men. Far from being a recluse shut up in his study and interested only in pouring over his books, the average professor is an active man of the world. He generally takes a lively interest in the sports and games of the undergraduate, even if he himself does not take part in some form of athletics. He is usually engaged in some form of activity entirely aside from his work of teaching. "In short", as Professor Canby puts it, "he is human".

It is to be hoped that "The Professor" will be widely read, will receive the respect it so justly deserves, and will exert its influence toward the solution of the professor's problems.

## A WORD IN DEFENSE

IT seems to be "the thing to do" at present to worry about our college. One Sunday not long ago one of the most prominent of the New York dailies had a page wide legend above the College News which informed the readers that Yale was facing one of the greatest crises of her history. It went on to tell of that phantom of which we hear so much, "Over-organization". Similarly, we find communications in the *Alumni Weekly* speaking of the "good old days", and decrying some of the present conditions. There can scarcely be a man in college who has not heard someone complaining of present conditions and wishing for a change. We hear criticisms of our methods of coaching, and of practically all our organizations. If all the things said were true, there would really be cause for worry. However, the SCIENTIFIC MONTHLY has no such pessimistic outlook. We are

proud of our teams, we are proud of our many organizations, we glory in the fact that we are a part of Yale. It is our hearty belief that Yale is at present at one of the highest points in her career. Let everyone appreciate the many blessings that we have and not try to find something about which to grumble.

* *

## THE FEDERATION OF SCHOOL AND SECTIONAL CLUBS

THE Federation of School and Sectional Clubs is an organization which fulfils an important function in the University. This federation was formed about three years ago for the purpose of increasing Yale's influence throughout the country, and of encouraging men to come to Yale from places where the representation is now small. Last month we published an article which showed that from far too many States the enrollment is pitifully small. This demonstrates beyond the realm of doubt that there is a field in the University for just such an organization. The name is self-explanatory. It is composed of the members of the various school clubs, as well as of the members of the different sectional clubs. Annually, the Federation publishes a pamphlet which is designed to give an idea of our great University to one who has, theretofore, known practically nothing about it beyond the name. This pamphlet is spread broadcast throughout the country in the hope that it may induce someone to come to Yale. The need of this is apparent when one realizes the growth of the smaller colleges in the last few years. Time was when the number of good universities in the country was small, but that time has passed, never to return. However, this year the Federation intends to publish a larger pamphlet than heretofore. Let every member of a school or sectional club pay up his dues and thus aid the Executive Committee in their important work.

* *

## CHANGES IN THE SHEFF CONSTITUTION AND HONOR SYSTEM

THE Student Council of the Sheffield Scientific School has, after the experiences of the past year, felt that it was necessary to make two changes in the two Constitutions of the School: (a) the Undergraduate Constitution was found to be incomplete and full of errors, and a change was absolutely necessary, since it was useless in its old form for practical work; (b) at the suggestion of and acting in coöperation with the Undergraduate Discipline Committee, it was found that this body was too large and that more perfect work could be done if it were smaller. Accordingly, the changes, which are printed in another part of this issue, were voted on and passed by the undergraduates, having been proposed and passed by the Student Council beforehand. These changes should be a great aid to the bettering and perfecting of our organizations and much credit is due the Student Council for their proposal of the measures. Organization and system are the agents that make anything a success.

* *

## THE 1915 S COMPETITION

THE 1915S competition for positions on the Editorial Board of the MONTHLY has already started. We wish to announce, however, that there is still plenty of opportunity for any Freshmen who desire to "heel" the paper. The competition has not yet proceeded to such an extent that new "heelers" would be seriously handicapped by their late start. Any member of the class of 1915S, who is willing to work hard, can, by expending a little extra time and energy, very quickly overcome the lead of those "heelers" who had the advantage of an early start. We would, therefore, urge all freshmen who are at all interested in this line of work, to "go out" for the MONTHLY. Any men who desire to take advantage of this opportunity should report at the office in Byers Hall at their earliest convenience. Our office hours are every evening, except Saturday and Sunday, from six-thirty to seven-thirty.

## OBITUARY RESOLUTIONS

At a meeting of the Class of 1913S, the following resolutions were passed on the death of a member of their class, C. D. Walcott, Jr.:

"Whereas, it has pleased God in His infinite wisdom to remove from our midst our esteemed and beloved classmate, Charles Doolittle Walcott, Jr., thus cutting short a life so full of promise: be it

*Resolved*, That we, the Class of 1913S, tender our most heartfelt sympathy to his family in their great bereavement, and *be it* further

*Resolved,* That a copy of these resolutions be sent to his family.

OGILVIE H. SHELDON,
WM. EMERY, JR.,
J. H. STEWART, JR.,
C. N. SNOWDEN, JR.,
A. MARKLE, JR.,
W. P. FOSS, JR.,
J. C. BAUSCHER,
F. M. DOUGHERTY,
L. B. PLATT.

At a meeting of the Class of 1913S, the following resolutions were passed:

Whereas, it has pleased Almighty God in His infinite wisdom to take from among us into His holy keeping our beloved classmate and respected friend, Edward Joseph Fogarty, and

Whereas, we are deeply sensible of the privilege of having known a man of such generosity and sincerity of spirit, be it

*Resolved,* That we, the members of the Class of 1913S, hereby express our deep sympathy for his family in their grievous loss, and be it further

*Resolved,* That a copy of these resolutions be sent to his family.

For the Class of 1913S:

BENJ. T. HARWOOD,
ROBERT N. HOEFLICH,
GEORGE MACNISH,
HENRY W. HICOCK,
THEODORE W. HORNER.

## THE NEW SHEFF CONSTITUTION AND HONOR SYSTEM

THE following changes in the Sheff Constitution, proposed by the Student Council, have been recently voted upon and passed by the undergraduate body of Sheff:

### I.—NOMINATIONS.

I. Nominations to be held by direct primary.

II, Number of votes cast.

(a) The votes to be cast by each member of a class for each office to be filled, are as follows:

1. For Senior Class Secretary, Class Day Historian, Class Day Orator, Class Prophet and Football Competitor, one vote, two being nominated.

2. For Class Deacons, for Spring Sport Competitors, three votes. Six being nominated.

3. For Senior German Committe, three votes, to be cast only by non-fraternity and non-society men. Six being nominated.

4. For Junior Promenade Committee, four votes. Eight being nominated.

5. For non-affiliated members of Student Council, seven votes, to be cast only by non-fraternity and non-society men. Fourteen being nominated.

6. For Class Day Committees, ten votes. Thirty-nine being nominated.

III. Number of men nominated.

(a) In all elections, the number of men nominated shall be twice the number of offices to be filled, except in Class Day Committees, when thirty-nine shall be nominated.

(b) In case of tie in last places, all men included in tie shall qualify.

(c) No man shall be a candidate for any office who:

1. Is rated.

2. Is on probation.

3. Has more than three (3) conditions.

### II.—ELECTIONS.

I. Elections shall be held in regular class meeting.

II. (a) The Chairman of the Sheffield Student Council shall call and preside over all meetings of all classes.

(b) In case of his absence the Chairman shall appoint a Chairman *pro tem* from the Student Council.

III. Elections shall be held on the evening of the day of nomination.

IV. All vacancies shall be filled by a new election.

V. (a) There shall be NO voting by proxy, and the polls shall be closed when the tellers go into executive session.

(b) Any ballot not containing the full quota of names shall be considered void.

Football Competitor—The election of the competitor for University Football shall be held on the second Monday in October. He shall be chosen from the Freshman Class and each member of that class shall cast one vote only, two men being nominated. In the regular class meeting each man shall vote for one of the two thus nominated.

Junior Prom. Committee—The election of the representatives to the Junior Prom. Committee from the Sheffield Senior Class shall be held on the second Friday in October. Each member of the Senior Class shall vote for four men, eight being nominated. In the regular class meeting each man shall vote for four men from the eight nominated.

Senior Class Secretary—The election of the Senior Class Secretary shall be held on the third Tuesday in October. He shall be chosen from the Senior Class and each member of that class shall cast one vote in the primaries. In the regular class meeting each member shall cast one vote for the two men nominated.

Class Deacons—The Class Deacons shall be elected on the third Friday in October of Junior year. Six men shall be nominated in the primaries, each man in the class voting for three men. In the regular class meeting each man shall vote for three men from the six men nominated.

Class Day Committees—

1. The election of the Class Day Committees shall be held the first Tuesday in November. The Committees are to be chosen from the thirty-nine men, nominated in the primaries without differentiation as to Committees; each Senior shall, in the regular class meeting, cast one vote for each committee, each committee being elected separately, and in the following order:

2. Class Day, five men; Senior Promenade, four; Class Book, four, and the Chairman shall be the Class Secretary, making five men in all; Class Book Historians, seven; Triennial, three; Statisticians, four; Cap and Gown, three; Picture, three; Supper, three; and Cup, three.

3. The ballots are to be counted after each vote; and the number of men, according to the number required for the respective committee, receiving the highest number of votes are to be members of that committee. This result shall be immediately announced and the successful candidates are to be eliminated as nominees for any other committee.

4. After the election, each committee, with the exception of the Class Book Committee, shall meet and choose its own chairman.

Byers Hall German Committee—The election of the Byers Hall German Committee shall be held on the second Tuesday in November. Each non-fraternity and non-society member of the Senior Class shall cast three votes, and three men are to be elected, six being nominated.

Baseball, Track and Crew Competitors—

1. The election of the competitors for University Baseball, Track, and Crew shall be held on the first Tuesday in March. Six men shall be nominated, each member of the Freshman Class voting for three men in the primaries.

2. In the regular class meeting each member of the Freshman Class shall vote for one of these for Baseball competitor, the ballots shall be taken up, counted, and the successful candidate announced. From the five remaining names one man shall be chosen for Track competitor. After his election the Crew competitor shall be chosen from the four remaining names.

Class Day Speakers—The election of the Senior Class Prophet, Orator, and Historian, shall be held on the second Tuesday in March. The nomination for each office shall be distinct, two men being nominated for each office. From these two men for each office one man shall be elected.

Senior Council—The election from the non-society and non-fraternity members of the Junior Class for representatives on the Senior Council shall come on the third Tuesday in April. Each

man shall vote for seven men in the primaries, fourteen being nominated. In the regular class meeting each man shall vote for seven men from the fourteen nominated.

## III.—RULES FOR PRIMARIES.

I. The polls are to be open between 9 A. M. and 2 P. M. in the basement of Byers Hall.

II. The date of primaries and elections to be announced two days previous to the time when they are to be held.

II. Names of candidates for all offices, except Commencement Committees, shall be posted at the polls in alphabetical order in view of the voters during the primaries, and the votes are to be restricted to the names which so appear.

IV. Preliminary Nomination.—Any seven members of the class shall have the power to propose one man as a preliminary nominee for each office. Such nomination must be on the printed form supplied by the Student Committee for the purpose. No man shall propose more than one preliminary nominee for any office.

The signature of the preliminary nominees with the signatures of their respective seven proposers attached shall be dropped in the ballot-box by 8 o'clock of the evening previous to the election, any blank not so signed shall be considered illegal.

It shall be the duty of the Chairman of the Student Council to see that the names are properly posted.

Tellers—The tellers shall be the Class Deacons. As a committee they shall have the power to fill any vacancies which may occur by the absence of one or more tellers.

The tellers are to put the results of the primaries in a sealed envelope, which is to be opened by the presiding officer at the time of the class meeting. The tellers are to maintain absolute secrecy as to the results of the primaries.

VI. All rated men and repeaters may choose the class in which they will vote, and can vote in such class and in no other. This choice must be made known to the Chairman of the Student Council in writing, before the first election and must be adhered to by the voter throughout the college year.

Should this man be a member of the Senior Class he shall designate as provided above, and he may vote but not hold office in the class so designated.

## IV.—AMENDMENTS.

This Constitution may be amended by a two-thirds vote of the student body of the Sheffield Scientific School.

### Revision of the Honor System.

### ARTICLE III.

The following are the amendments to Article III, Sections 1 through 7, of the Honor System:

Section 1. There shall be an Undergraduate Discipline Committee of five (5) members to which all criticisms and complaints may be addressed.

Sec. 2. The Committee shall be composed of at least three (3) members chosen from and by the Student Council, and the remainder chosen from the incoming Senior Class by the Student Council at the first meeting after organization of that body.

Sec. 3. The officers of the Committee shall be a Chairman and a Secretary who shall hold office for one year.

2. The officers shall be elected during the first month of the Fall Term by a majority of the members of the Committee.

3. The Chairman shall preside at all meetings. In case of his absence, the committee shall elect a chairman *pro tem.*

4. All meetings shall be called by the chairman or by a written notice signed by two members of the committee. Not less than one (1) day's notice shall be given of the time and place of said meetings.

5. The Secretary shall keep the minutes, have custody of the Committee records, and conduct the correspondence.

Sec. 4. The punishment of any violation of the Honor System shall be by and at the discretion of the committee and shall be final.

Sec. 5. Any punishment inflicted by this committee shall be the result of four-fifths vote, except in the case of expulsion which shall be the result of the unanimous vote of the committee.

Sec. 6. A quorum shall consist of five (5) members.

Sec. 7. The required vacancies shall be filled by the Student Council provided no quorum can be had.

# THE PANAMA PACIFIC EXPOSITION

*E. Carlisle Hunter.*

WORLD'S Fairs and expositions of all kinds have sprung up every few years, until now it seems that all possible devices have been conceived to make each stand out from the other. Yet in 1915, San Francisco intends to show the whole world something entirely unique in the way of fairs. Even now definite plans are laid so that by the middle of the summer, fourteen of


FESTIVAL HALL.

the buildings will be under way, and they will not be of the usual blaring, white type, either. Instead of this colorless effect, brilliant combinations will be sought to lend life to the picture. For many months already, scores of artists, architects and landscape gardeners have been in consultation over the best methods to make the color effect not only as striking as possible, but beautiful as well. The ground tone will be about the color of travestin stone, which, when exposed to electric light, will make a soft yel-

low tint, both pleasing and restful to the eyes. The higher and more conspicuous buildings, such as towers, spires and domes, will be of a richer tone, making the whole effect of indescribable beauty. At the main entrance, and dotted here and there about the grounds, will be pools and fountains, overhung with cool and shade-giving trees.

Unlike those in other expositions, the buildings will be situated near one another, so that no long walks will prevent the tired sightseer from seeing all that there is to see. Before, isolated buildings, because of their isolation, appeared dwarfed and so lost some of their grandeur. Now, in being grouped together, each will set off the other and make a far more imposing effect. One of the "features" of the exposition will be a mammoth oriental bazaar, planned to follow closely the great bazaars of the East. Gorgeous colors will bedeck its sides and warmly tinted figures will lend beauty and life to the stupendous structure.

In speaking of the rare color effects of this miniature city, Jules Guern, the director of the coloring of the Exposition buildings, says: "Imagine a gigantic Persian rug of soft melting tones, with brilliant splashes here and there, spread along the water side for a mile or more, and you may get some idea of what the 'City of Color' will look like when viewed from the heights about the bay. This color plan alone will make the Exposition unique among the expositions of the world."

The grounds at Harbor View occupy six hundred and twenty-five acres. From this position can be seen Golden Gate on the West, the ocean and the harbor, while on the inland side are the imposing mountains of Marion County.

The Exposition buildings will be divided into three great groups. The left hand group will comprise the concessions center, occupying sixty-five acres; the center group will consist of fourteen palaces to be used for exhibition purposes, while the right hand group will include the buildings of State. The main exposition group will lie between two great garden boulevards, on one side a marvelous esplanade along the shores of the bay, while on the other is a transplanted tropical garden, eighteen hundred feet long and three hundred feet wide. This joining of the large building with five smaller ones will resemble, from the distance.

one mammoth palace. Nearer, it will be seen that the buildings are separated by large courts, which join others running at right angles to them. Pools and semi-tropical plants will break the monotony and add picturesqueness to it all.

The theme of the great interior courts will suggest the meeting of the East and West. The huge court on the east will suggest the Orient, rich in Oriental splendors; another, on the west, will suggest the Occident, its theme exemplifying the wealth which nature has conferred upon the Saxon, who has ever pushed to the West. These courts will be far surpassed, however, by the great-

FACADE OF FESTIVE COURT.

est of all courts, the Court of the Sun and Stars, its theme representing the meeting of the East and West at Panama. This court, which joins the other two, will stand among the most brilliant architectural pieces of the great expositions of America and Europe. It will be the central architectural theme in the City of Palaces in San Francisco Bay; it will be distinguished by the majestic scale of its architecture, by the splendor of its conception, and by its warmth, life, and spirit of joyousness.

The largest of the three main courts will be five hundred by nine hundred feet square. A tower on the north will form a

central dominating point of architectural composition. The palaces will, as it were, be set among gardens. Cypress and pine trees will surround them; shrubs, making with the trees, a wall of green. On the esplanade, which will extend about a mile along the water front, will be fountains playing, and statuary of all description will be set around to add beauty to the picture.

The Panama Pacific Exposition will be the first of the great world's fairs to celebrate a contemporaneous event, and for this reason, no exhibits manufactured before 1905 will be subject to award. The opening of the Panama Canal will prove one of the greatest events in the history of the United States, and holds great possibilities in store for this country. This feeling of the great sociological value of this canal is one which the Panama Pacific Exposition hopes to emphasize and signalize. The long term of the Fair, lasting more than nine months, presents an even better opportunity to make felt the importance of the Panama Canal.

A calendar of events has yet not been definitely decided upon, but in June, 1914, will come out with the details. The first feature, however, will be an assemblage of a fleet of the battleships of the world. The foreign vessels assembling at Hampton Roads will be joined by the vessels of the United States Navy, and proceed through the Panama Canal to Golden Gate, arriving at the opening of the Exposition. In all, it is anticipated that more than two hundred battleships will take part aside from those of our own navy. Twenty-five nations have accepted America's invitation to take part in the Exposition. Japan alone will expend one million dollars upon its display, and will dedicate the building to this country when the Exposition closes. An aquatic sports festival will follow two months later, and will bring together some of the speediest motor boats in the world, the newest submarines, and the best oarsmen in the country.

A little later, an international sporting meet will be held, fostered by the sporting societies of the entire world. Automobile races, Olympic games, intercollegiate meets, military drill and maneuvers, aviation and other features will have a prominent part. October will bring around the most brilliant event of all. For ten days, there will occur a series of pageants, startling and marvelous in coloring and beauty. The whole scheme will be

to represent Oriental costume and ideas which will be an entire inovation to Occidental eyes. As a conclusion to the Fair, there will be a week of Western fiesta, a representation of the picturesque days of '49, the Lewis and Clark expedition, the mission era of the Franciscan padres in California, and other historical events, familiar to every true Westerner. Every State in the West will take part in the demonstration; this personal participation having the added advantage of making all Westerners seriously interested in the Exposition. Already California has


COURT OF THE SUN AND STARS.

passed an act permitting the boards of supervisors of the various counties to levy a tax for exposition purposes. More than $4,000,000 is being raised as a result of the enactment. More than one hundred million dollars of public money will have been expended upon various civic improvements by 1915. The State of California has issued bonds for the improvement of the water front at a cost of nine million dollars. Even one of the newspapers has offered prizes to the extent of almost eight thousand dollars for the best flower decorations on the lawns of homes.

New York State has set an example for other states by making a preliminary appropriation of seven hundred thousand dollars. More than eight hundred applications for exhibit space have been received from all parts of the world, some of the exhibits ranging in value from two hundred to three hundred thousand dollars. More than two thousand applications for concessions have been filed with the Exposition company; some of these concessions will cost two hundred and fifty thousand dollars. One of the most marvelous of these will be a miniature of the Panama Canal, taking twenty minutes to make the trip. In all, the Panama Pacific Exposition will be by far the largest and most expensive fair ever held in the United States and will mark one of the greatest events in the commercial history of the world, the opening of the Panama Canal.

# DOLLAR DIPLOMACY

*Peyton R. Anness.*

A GREAT deal of interest has been aroused lately by the refusal of President Wilson to adhere to the policy of the Taft Administration with regard to the proposed Six Power Loan to the Chinese Republic. To obtain a comprehensive view of this question it is necessary to trace the history of the Chinese Loan from its beginning.

Just after the Chinese revolution, the salient feature in the situation of the new republic was an immediate and urgent need of money. In the disorder that followed the downfall of the Manchu Dynasty, the new government found the collection of taxes impossible. In June of 1912, the Chinese Minister of Finance, in balancing the receipts and expenditures of the new government, estimated the deficit for the current fiscal year at 270,000,000 taels ($80,000,000). The treasury was left without funds to meet the current expenses of the government and the Minister of Finance was unable to answer the insistent demands for money of the provincial authorities and the unpaid army. Under these circumstances, the new republican government found itself forced to apply to foreign bankers for aid. The Minister of Finance began negotiations with an international association of capitalists, known as the Six Power Syndicate, for a loan of three hundred million dollars. This Six Power Group was composed of Great Britain, the United States, Germany, France, Japan, and Russia.

This entrance of governmental policy into the affairs of international banking gave rise to the term "Dollar Diplomacy". It had its origin in the Knox manifesto, issued in 1909, proposing that the Powers unite to buy the Japanese and Russian railroads in Manchuria. Although this project failed, it formed the germ and beginning of dollar diplomacy. Thereafter it took a more rational form and progressed more smoothly and effectively. In 1909, the United States, acting on the promise of the Chinese Government, compelled Germany, England, and France to admit

it to a share of the loan for the construction of the Hukuang Railroad. The Government invited the Morgan, Kuhn-Loeb, First National, and National City bankers to participate in this loan. Thus the American Group was organized, and the Four Power Group, consisting of England, the United States, Germany, and France, was established. In 1911, this Four Power Group was prepared to loan China fifty million dollars on the security of the Manchurian revenue and asked only for the appointment of a foreign financial adviser. A little later the Four Power Group decided to take Japan and Russia into partnership. Thus was formed the Six Power Syndicate to whom the new Chinese Republic appealed.

When the Chinese Minister of Finance asked the aid of this association of capitalists, the representatives of the several groups in the syndicate held secret conferences, at first in London and later in Paris. The purpose of these meetings was to reconcile international interests and formulate the terms of the loan. They came to an agreement on June 20, 1912 and submitted to the Chinese Minister of Finance an offer to furnish three hundred million dollars upon certain conditions. Among the conditions specified, was the stipulation that the expenditure of the fund should be under the supervision of foreign financial experts. Of this proposed loan, two hundred and fifty millions were to be advanced immediately upon China's acceptance.

It was expected by everyone that this offer would solve the financial problems of the young Republic. It served, however, to raise a new problem which was no less difficult and which seemed to threaten the stability of the ministry of the Republic. This new problem was caused by the formation of a large and powerful party which opposed the acceptance of the proffered loan on the ground that it might lead to an excuse for foreign intervention in Chinese affairs and thus endanger the independence of the Republic. Several members of Yuam Shi-kai's Cabinet and a large number of governors and other provincial officials joined this party. Among other prominent men, the Minister of Commerce and Industry and the Governor-General of the Yantsi Valley objected to the condition of the loan which required the supervision of the government finances by foreign experts. They

declared that if the Republic submitted to this control her condition would be little better than that of Korea under the Japanese protectorate. This party proposed to reject the loan and offered a substitute means of obtaining the necessary funds to carry on the government. Their proposition was to raise the required money by a "national patriotic subscription" among the Chinese and by authorizing the Government to issue "fiat" paper money. In different parts of the country, "Patriotic Subscription Associations" were formed by the supporters of this policy. Many army officers and civil officials agreed to subscribe half their salaries. By July, 1912, the two cities of Nanking and Hankow alone had raised 3,400,000 taels. The Government required, however, as was pointed out by the Minister of Finance, seven million taels a month for current expenses, to say nothing of the interest on existing foreign debts. He also pointed out that for this purpose "fiat" paper money would not serve. In his opinion, no such means as a "national patriotic subscription", however liberal, could ever possibly raise money enough to cover the deficit of 270,000,000 taels. It was, therefore, his policy to accept the proffered loan of the Six Power Syndicate and submit to their conditions.

While this controversy continued in China, the Six Power group stood ready to advance the money whenever the Republic should accept the loan. The banks concerned in the loan were the Hongkong and Chankhai Banking Corporation of London, J. P. Morgan & Co., Kuhn-Loeb & Co., the First National Bank of New York, and the National City Bank of New York, the Deutsche Asiatische Bank of Berlin, the Banque Indo-Chine of Paris, the Russo-Asiatic Bank of St. Petersburg, and the Yokahama Specie Bank of Japan. The Governments of the six powers stood back of their respective banking concerns and guaranteed their loans. It was the policy of the Taft administration to favor this dollar diplomacy. Shortly after President Wilson's inauguration in March, he announced that the Government would not accept any responsibility for, nor exercise any authority in connection with the Six Power loan to the Chinese Republic. Accordingly, the American group of bankers, through J. P. Morgan & Co., who have represented the United States in the nego-

tiations of the Six Powers, announced that they had withdrawn from the enterprise. The United States is, therefore, no longer represented in the Chinese Loan Syndicate.

The policy of Secretary Knox in favoring the participation of the American group of bankers in this loan and the guarantee of the loan by the Government was based upon the belief that in this way, the United States, by having a voice in fixing the conditions of the loan, would have a much more potent influence for restraining the Powers than could be exercised by a non-participant. It was the desire of the Taft Administration to maintain the open-door policy in China inaugurated by Secretary John Hay in 1899. For this purpose the Government requested the American group of bankers to take part in the Chinese loan enterprise. However, now that this governmental support has been withdrawn, Morgan & Co. and their associates do not feel justified in undertaking the burden and responsibility of a great international syndicate loan to China. The amount of the proposed loan is so tremendous in size that China would go bankrupt if the money were not administered properly. If the bankers of the United States were to enter into any such loan, the necessity of the assurance of our Government that Chinese finance would be properly administered would be necessary. The guarantee of the foreign Governments that the loans would be collected would also be necessary to give confidence to the foreign public in buying the bonds. Also, the backing of foreign Governments would be essential as a guarantee of the effectiveness of the auditing and supervision of the expenditures of the Chinese Government. The administration of public finance in China is notoriously dishonest and corrupt. It is, therefore, obvious that the American group of bankers cannot enter into such an enterprise unless our Government is willing to support them and assure the proper and honest administration of Chinese finance. Our bankers will not lend money under the insufficient guarantee of China alone.

President Wilson, however, feels that our Government is not justified in taking an official, or even a semi-official, part in such a loan. He fears that the responsibility on the Government's part, which would be implied by requesting the American group of bankers to undertake the loan, might lead the Government to

forcible interference in the financial and political affairs of the Chinese Republic. In his opinion, the acceptance of such a responsibility is obnoxious to the principles of our Government. Moreover, the present Administration believes that it is better situated to maintain a friendly attitude toward the new Republic, now that it has thrown off any suspicion of financial interest that might have attached to participation in the proposed loan, than it would have been had it adhered to the Knox policy.

It is interesting to note that in arriving at these conclusions the Wilson Administration proceeded on exactly the same premises that prompted the Taft Administration to demand participation in the proposed loan. Thus while each reasoned on the same grounds, they came to directly opposite conclusions. It yet remains to be seen which method is the best for maintaining the open door policy in China.

BYERS HALL READING ROOM.

# THE GREAT LAKES

*W. F. McLean.*

THE traveling public of our United States usually goes to Europe when on sight-seeing tours, little realizing the beauty and the wonders of our own inland waterways. Let the traveller take a trip from one end of the Great Lakes to the other, and he is astounded at their enormous commerce, and enraptured with the magnificent scenery along the connecting rivers. Of late the "lake trip" has become so popular that there are at least sixteen million persons carried yearly on the waterways of the entire chain of Great Lakes.

Of the numerous passenger steamers, the *Northwest* and the *Northland* have been to the lakes what the limited trains are to the trunk lines of a railway. Since 1894-5, when they were commissioned in service between Buffalo, Chicago, and Duluth, they have been the wonder of the tourists from the home ports and from afar. They closely resemble a large type of Atlantic liners, and it is hard to believe, upon seeing them, either in mid-lake or the connecting waterways, that some giant of the briny seas has not been transplanted into fresh waters.

These splendid steamers are three hundred and eighty-six feet in length on deck, forty-four feet beam, and twenty-six feet depth, and register five thousand tons. The hulls are of steel throughout and were constructed on the models of the swiftest liners. They are not only modern and luxurious in every appointment, but in strength and safety are not inferior to the Atlantic liners.

On their profitable route to the West and Northwest the steamers use a common path from Buffalo to Mackinac, which is the dividing point of the traffic destined for Chicago and Duluth. This beautiful island, which has very aptly been called "the hub of the unsalted seas", is the Mecca of a large share of the tourists in the lake region. The busy scenes in the harbors of the lake ports along the course are keenly interesting. Leaving Buffalo early in the evening, the traveller has a vivid view of the commercial and industrial activities of a large and thriving city. Off

on the port side in the gathering darkness of night are shooting tongues of flame and the red glare of the furnaces, for the gigantic steel plants of Buffalo almost rival those of Pittsburgh. The night voyage up Lake Erie brings the ship by early morning off the city of Cleveland. Into the harbor and up the narrow stream, she is led by tugs, until, at her wharf, the high buildings and streets of Ohio's metropolis show but dimly through the early haze and smoke.

A LAKE FREIGHTER.

After a brief stop, the steamer is drawn out of the river, and is soon bound for the beautiful run up the Detroit River. Here, for twenty miles are entrancing scenes of green banks, shaded woodland, and verdant farming lands to the very water's edge, and occasionally a small town or hamlet. Detroit, the "City of the Straits", lies along the river front for nearly ten miles. The parks, of which Belle Isle is the most beautiful, have made this city famous. As the steamer continues on her way past Belle Isle, the traveller is given a splendid panoramic view of lagoons,

driveways, greensward, and attractive buildings of artistic design. Above the island the river widens out into the expanse of Lake St. Clair, and after an hour's run the vessel steams slowly up the St. Clair River. Along this stream lies the St. Clair Flats, a city on the water—the "Little Venice". All through the rivers boats of all sizes are passing by the dozens, affording a pleasant diversion in contrast to the open waters, where the monotony is only occasionally relieved.

When Lake Huron has been crossed and you have paid a short visit to historic Mackinac Island, your steamer turns and winds its way up St. Mary's River to the famous "Soo" locks. Here, within a few minutes, your boat is raised eighteen feet to the level of Lake Superior, where she steams on through the greatest of the Great Lakes. At the head of the lakes, where the trip comes to an end, is the port of Duluth-Superior. Here at the twin cities are new scenes of intense commercialism. The great ore docks are filling the cavernous holds of the giant freighters, other docks are discharging the return cargoes of coal for the Northwest, while at still other docks great elevators are emptying their storage of grain into the lake monsters, which hurry it to the East. There are immense lumber interests as well as the feverish activity of a railroad distributing port, for this is the head of the Inland Seas navigation for the United States.

Not many years ago only wooden steamers and sailing vessels were to be seen on the Great Lakes. The era of steel shipbuilding was heralded by the appearance of cigar shaped vessels, known as "whalebacks" or "pigs", which constitute the most picturesque oddity of the fresh-water fleet. This type was invented about 1889 by Captain Alexander McDougall, and within five or six years forty-five such vessels were built at Duluth. They were designed primarily for the ore-carrying trade, and they derive their name from the fact that their main deck of steel is rounded off at the sides, very much resembling the back of a whale. With the hatches bolted down and rendered water-tight, the vessels are seaworthy to a remarkable degree and will outride any storm or gale. The boats proved unprofitable and most of them were sent to the Atlantic by way of the Welland Canal, where they were cut in two in order to make the passage. In Lake Ontario they were

again put together and are now doing duty as coal-carriers along the coast.

The modern ore-carrier, as represented by the comparatively new steel ships which are over six hundred feet in length, is a type peculiar to the waters of the Great Lakes. In constructing the ship, the propelling machinery is placed in a separate water-tight compartment in the extreme stern, in order to secure the maximum cargo space. Above the engine rooms are the quarters for the crew. The wheelhouse, captain's, and mates' cabins are located

MONSTER ORE CARRIER.

in the extreme bow. A salt water tar, who recently saw one of the huge boats for the first time, exclaimed in derision, "How'd the cap'n and chief engineer ever get acquainted?" The forward cabins are luxuriously furnished, and generally several of the finest boats of a fleet are fitted out with an extra cabin and staterooms to accommodate the owners and friends, for a trip up the lakes on a freighter is delightful in summer. The entire cost of such a ship is about five hundred and fifty thousand dollars.

Considering the size and tonnage of the ore boats, their speed is relatively fast. An average of eleven miles an hour is usually maintained on load draft while, when returning light, they run at the rate of thirteen miles an hour. The rapidity with which they are loaded and relieved of their cargoes is wonderful. The *Coray* took in over ten thousand tons of ore and had started on her way down Lake Superior within thirty-nine minutes from the time she had docked. This was exceptional, but it shows what can be done with the excellent docking facilities of our Great Lakes ports. What is more remarkable, the clam-shell buckets at Conneaut, Ohio, unloaded eleven thousand tons of ore from the hold of the *Morgan* in three hours and eight minutes. A few hours later the monster ore-carrier, *Thomas F. Cole*, steamed into the harbor and was out on Lake Erie again within three hours and twenty minutes, leaving behind a cargo of ten thousand seven hundred tons. This is less time than it ordinarily takes to fill the great freighters.

In spite of the fact that the shipping season lasts only 240 days, 46,303,423 short tons of iron ore passed through the Soo locks in 1912. The coal traffic through the same canal amounted to 14,931,594 tons in the same year. Before the closing of navigation 174,086,456 bushels of wheat left Lake Superior for lower lake ports. Adding to this traffic the profitable package-freight trade, the little towns at the head of St. Mary's River saw the record for 1912 swelled to a grand total of 72,472,676 short tons, an increase of 14,995,460 tons over the previous year's shipment.

The United States Government has been very active in protecting this enormous traffic; and it has adopted a vigorous policy in making provisions for the increase of the lake tonnage, the encouragement in building larger vessels, and for the safety of commerce and protection of life. Throughout the entire chain of Great Lakes the Government engineering corps and dredging contractors are busily engaged in removing the obstructions in the way of free navigation of channels and harbors. In some places these works are of great magnitude, as at the Limekiln Crossing in the lower Detroit River, the new Livingston Canal in the same stream, and the new canal and locks at Sault St. Marie. All permanent improvements are directed toward an ultimate depth of

twenty-five feet in harbor and rivers from the head of Lake Superior to the foot of Lake Erie. The maximum depth has been between twenty and twenty-one feet; and the present aim of the Government is to effect a deepening of one foot a year until the entire work is completed.

For the safety of navigation, lighthouses and lightships mark every rocky and dangerous coast, while countless buoys and other

LOADING THE ORE BOATS.

beacons guide the sailors through the channels of river and harbor. Life-saving stations as efficient as any on the seaboard are placed at dangerous points along the lake shores. There are harbors of refuge, Government weather reports and warnings of approaching gales, fire boats, and powerful wreckers to protect and save, or recover vessel property. Thus, to-day, every appliance that the genious of man can devise and a liberal Government can afford is provided for the safety and betterment of the great merchant marine of our Inland Seas.

# LITERARY WORK OF THE SHEFF ENGLISH FACULTY

*William Seymour, Jr.*

THE average undergraduate generally imagines that the entire time and energies of the men who instruct him are taken up by the work of the class room. One is, therefore, astounded to find the great amount of work which is accomplished by these members of the Faculty in outside activities. It is the purpose of this article to give a short review of the literary work of the English Faculty of the Sheffield Scientific School. It has been found impossible to give space in this article to every member of the Sheff English Staff. It has, therefore, been thought advisable to confine this review to an account of the literary work of the Professors and Assistant Professors only.

Professor Wilbur Lucius Cross, who is the head of the Sheff English Faculty, is also the editor of the *Yale Review*. Anyone familiar with the work of editing will at once recognize the fact that these duties are very arduous and leave little time for anything else. Professor Cross has been editor of the *Review* ever since its start, and practically all of his time outside of the class room is devoted to this work. Under his editorship, the *Yale Review* has grown to be a large literary magazine of national influence and reputation. It fills a long-felt want in Yale for a magazine of this type. It is not solely for Yale students and graduates, but it is something that any man who likes good literature would enjoy reading. In fact the *Review* in its short existence has already grown to be one of the leading literary magazines of the day. The editor has secured many contributors of note, among whom are various prominent members of the Yale Faculty. Besides doing the editing work, Professor Cross writes occasionally for the magazine. For example, in the October number he wrote an article entitled "The Return of Dickens."

"Development of the English Novel" is the title of a book written by this same author, giving an account of the history and growth of the novel, starting with the middle ages and extending down to Kipling's time. This book has met with great success,

as is proven by the fact that it is now in its twentieth edition. Henry Holt and Company are having Professor Cross edit for them the "English Reading for Schools" series, comprising thirty-five volumes. The series was started two years ago, but has not yet been completed. Among other extra curriculum activities in which he is engaged are works on Fielding and Smollet, both of which will be published as soon as they are completed. Another important work by Professor Cross is a biography, recently published, on the "Life and Times of Lawrence Sterne". This book, as its title implies, deals not only with the life of that Irish divine, but also with the contemporaneous history of his times.

Another member of the English department, but one who is pursuing a different line of endeavor than that of some of the others, is Professor Henry Seidel Canby. His taste runs to literature and the short story, although recently most of his spare time has been used in helping Professor Cross edit the *Yale Review,* as Professor Canby is assistant editor of that publication. He, like Professor Cross, also occasionally writes for the *Review.* Also *Harper's* and *The Century* are both recipients of articles and stories by this writer. The majority of these contributions are short stories. For example in *The Century* of last October he had a short story, entitled "The Great Discovery About Buxton", which presents a view of college life from the Professor's standpoint. Professor Canby has also used this same theme, college life, in two articles recently published in *Harper's.* The first, "The Undergraduate", which appeared in the March issue, is a study of the life and habits of the undergraduate in American universities. The second article, "The Professor", which came out in the April number, is practically on the same subject as the first, except that it deals with the Professor instead of the student.

Professor Canby spent last summer in the Sierra Mountains in company with another man who was doing research work in forestry. Together they wrote a report on the forest conditions in the Sierras, with reference to the Sequoia forests in particular. This article not only presents an account of their trip and their work in the Sequoia forests, but gives also a scientific study of the forests of this region. The paper in which this account appears will be termed "June in the Sierras."

Professor Canby is one of the joint authors of the college text book entitled "English Composition in Theory and Practice", by Canby and others. This book is undoubtedly familiar to all who have taken any of the English courses in Sheff. This same author is now writing another text book, for use in high and preparatory schools, entitled "High School Rhetoric". Professor Canby is writing this in collaboration with a high school English teacher. The work, when completed, will be published by the Macmillan Company.

Professor George Henry Nettleton of the English department of Sheff has, for some time past, been making English drama his specialty. In the "Cambridge History of English Literature" he is the author of a section in Volume Ten entitled, "The Drama and the Stage". This work, which is being published by the Cambridge University under the general editorship of Professor Ward of Cambridge, when completed will comprise about fourteen volumes. It will take up in minute detail the entire history of English lierature. Professor Nettleton is one of the few American contributors of the work. His section deals largely with the eighteenth century drama, on which he is an authority. In connection with this section he has also written a bibliography covering with the greatest detail the works of the authors and dramatists of that period. This latter is the result of a great deal of labor.

Besides this, Professor Nettleton has just finished writing a large book on which he has been working for several years past, entitled "English Drama of the Restoration and Eighteenth Century." This book has been accepted by the Macmillan Company, and will be published some time later during the spring. It is a study of the English drama from 1642, when the theaters were closed by the Puritans, to the height of Eighteenth Century comedy in Sheridan. It is the first comprehensive work of its kind ever written. Another work of Professor Nettleton's that has recently been published is the new edition of "Old Testament Narratives" in the "English Reading for Schools" series, of which Professor Cross is editor-in-chief. One of the features of this book is a portion in the back which is devoted to hints on Bible study.

It is of great interest to the Yale undergraduate to learn that in the near future a set of six volumes is to be written on six of the leading American Universities. Professor Nettleton has been invited to write the volume on Yale. The work is to be published by the Oxford University press. Professor George P. Krapp of Columbia is to be general editor of the series. In addition to this Professor Nettleton is and constantly has been contributing to the various English and American publications. Usually these articles are on topics connected with modern English drama.

Professor Henry Nobel MacCracken, another member of our English Faculty, makes a practice of spending his summers in England working on middle English poetry which he has made his specialty. He is now engaged in writing some material on this theme. Like many others of the English department, he frequently contributes to the *Yale Review*, and both of the past two issues contain articles by him. During the last two years, Professor MacCracken has published two books, "The Minor Poems of Lydgate", and the "'Serpent of Division', by John Lydgate". Professor MacCracken also intends to publish, at some future time, a text book on Chaucer. He was the originator of the Byers Hall Wood Fire Talks, which are now so popular among the undergraduates of Sheff.

Professor Frederick Erastus Pierce, also of the English department, has been devoting a great deal of his time to poetry. A year ago this last fall he published a large volume of poems, all of which are his own work. The book is entitled "The World Destroyed, and Other Poems". It consists of one long drama with its subject matter taken from the story of the deluge, and a large number of shorter poems with various subjects. The complete book has in it one hundred and seventy-three pages, which, in view of the fact that it is all poetry, shows that Professor Pierce has been a very busy man. Another book by the same author, written jointly with some others, is one that is well known among the undergraduates, it being used in the English Composition course, and has the familiar name, "Theory and Practice". The new edition has just come out during the past year. Professor Pierce is also the author of an article recently published in

and also [illegible] with chains. As soon as the convicts came on board they were seized and thrown into irons for the entire journey. They were then put in cells seven by seven for the most part, but some only seven by four, giving the men just room enough to roll up in the one thin blanket that the government allowed them, if they were lucky enough to get in a cell by themselves, but often three or four were thrown into one of these small places. They were always chained to the wall of the cells by heavy iron chains, and the heavy leg-irons were never left off. It was impossible for a man to escape, for even if he should get

THE CONVICT SHIP.

out of his cell, he would be unable to climb the iron ladder which led to the deck. They were always pulled up by means of a *pully* rigged up over the main hatch. If, however, they attempted to escape when they were receiving their fresh air on the deck, which they were allowed for one hour a day, they would be flogged with the cat-o'-nine-tails.

This flogging reached an art on board the *Success*. One of the convicts was required to do the actual work. The only way that the Captain could get one of them to do it was by offering a reward. He said that to any man who would do the flogging he would give so many privileges of good behavior; but on the

# THE CONVICT SHIP

*A. C. Ketcham.*

FOR several weeks last month the old convict ship, the *Success*, was on exhibition in New Haven Harbor. The history of this ship, as told in her log-book and other records kept by her officers, is extremely interesting and indeed almost incredible.

The sole surviving British convict ship, the *Success*, was built at Moulmian, in British India, in 1790. The vessel was intended for a ship of peace, and was therefore constructed in the best possible manner, with all the latest improvements. It was built entirely of Indian teak wood, one of the toughest woods known, had a tonnage of 580 tons, and was 135 feet over all.

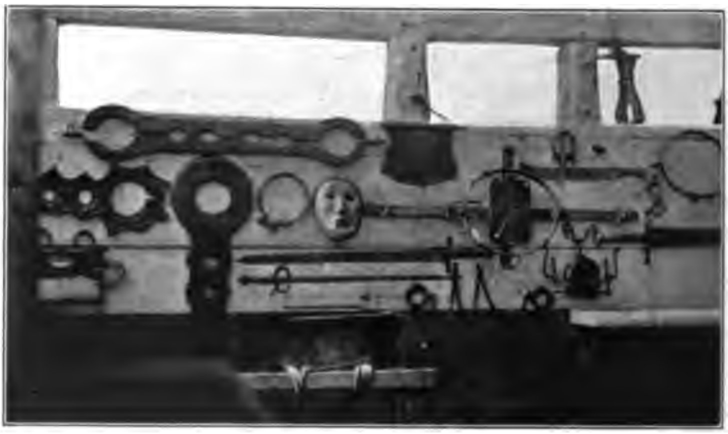
The sides and bulwarks were two and one-half feet thick, in order to be able to withstand the attacks of the pirate ships, which at that time were everywhere on the seas. On one of her very first voyages, the *Success* resisted the attack of a French piccaroon. The engagement took place in the Bay of Bengal, and, after a fierce fight lasting several hours, resulted in a heavy loss to the Frenchman. Scars of this and similar other engagements can still be seen on the sides and masts of the old vessel.

In 1786, the English government decided to transport most of their convicts, serving seven or more years, to Australia. For this purpose boats were chartered, called convict ships. It was not until the year 1802 that the *Success* entered this field of business. The government entrusted the work of carrying these men from England to Australia to contractors, who received six pence a day for each man's food allowance. These contractors, being greedy for money, gave the prisoners the least possible amount of food. As would be expected, the convicts became sick, and in many cases died. The log-book of one of these ships says that in 1802 out of 939 male convicts leaving England, over 260 died on the voyage and 50 more upon landing.

The lack of proper food and nourishment was not the only punishment that these prisoners had to endure. The *Success* in her days of active service carried 80 pairs of heavy handcuffs

this change was due to the discovery of gold in Williamstown in 1852. Crowds of desperate men and criminals of the very lowest type came in. In that mad rush for gold, crimes were committed everywhere. The town jails were soon full. Then the government ordered the *Success* to proceed to Hobson's Harbor and anchor there as a floating prison.

Soon the ship was filled with the most notorious "bushrangers" of Australia. These men are still remembered out there, for they were always giving their warders a hard time. It became necessary to put up a high iron fence around the deck where the



INSTRUMENTS OF TORTURE.

prisoners took their air, for they would try to overcome the guard almost every day.

It was customary to work the good behavior men on the roadways that the government was at that time building. Many attempts to escape were made by the men on shore. The worst one took place when the Geelong railway was being formally opened. The warship which was usually anchored close by to protect the crew of the *Success* if any serious uprising took place, or to fire on shore if the convicts should overcome their warders and try to escape, had gone to Corio Bay to take part in the demonstrations. The convicts, believing that this was their chance,

"rushed" the guards at a given signal. The guards were not taken by surprise, and fired a deadly volley into their midst, killing or wounding nine. This confused the prisoners. Some hid behind large boulders, and tried to kill the warders with stones; others smashed their leg-irons and tried to escape, only to be shot down by the guards. Assistance arrived from one of the other ships lying in the harbor, and the convicts were soon recaptured. They were hurried to the ship, where they were all flogged and given the salt bath. Then the leg-irons were riveted on again, and they were all thrown into the cells on the lower tier. All night long the banging of their chains against the walls and their screams of defiance and suffering could be heard by the people who lived on shore.

It is small wonder that the convicts tried to escape or even drown themselves in preference to the slow death they were receiving at the hands of their warders, and yet very few ever escaped this latter way. An old ex-convict who had served time on the *Success,* said that they would try in every possible way to arouse the warders to anger so that they might be killed. They would insult the warders every chance they got; they would try to jump overboard, hoping to be shot in the attempt, which never happened, for they were always stopped in time. They would be subjected to the cat-o'-nine-tails and thrown into solitary confinement. One man was ordered to be chained short in his cell so that he could not lie down. This punishment was not to last only one or two days, but for thirty. From these facts the reader can easily see why these ships received the name, "Floating Hells".

Soon a change for the better was taken, for the people of Sidney would no longer stand the disgrace of having these boats anchored off the shores of Australia. In the year 1857 Parliament decided to make an investigation of the conditions. After a great deal of testimony by the convicts themselves, Parliament passed a law forbidding the use of the prison ships for a prisoner serving any length of time.

For a long time the *Success* lay in the harbor untennanted. From then to the present time her use has been varied. She has been, at different times, used as a women's prison, after great

modifications were made in rules; as a discipline ship for young criminals; and as a powder ship. It was only through a clerical error that she was not destroyed with the rest of these old convict boats. Several attempts were made to blow her up, but they all failed. She was, however, finally sunk, and lay below the waters for about five years. Then she was raised, and has been on exhibition all over the world ever since.

These facts may not seem creditable, but if one has been on board and seen the cells, the instruments of torture that hang all over the bulwarks of the old boat, and read some of the records found in her cabins, one realizes how true they are.

"Y" MEN LEADING THE PROCESSION FROM THE STATION AFTER THE ARRIVAL OF PROFESSOR TAFT.

# THE OHIO VALLEY FLOOD

*P. Winslow.*

NOW that the terrible floods of the Ohio River Valley are over, and we may look back upon them with at least the semblance of a proper perspective, it immediately becomes evident that the earlier newspaper accounts were greatly exaggerated. Of course, the loss of life will never be accurately determined, but from later statistics, we may be certain that it is greatly less than the thousands at first predicted. As to the loss and damage done to

property, only the vaguest assumption may be made. Thousands must have suffered losses, and we must also consider the losses of railroads, cities, counties and states, due to the destruction of track, bridges and levees.

The floods were the result of a great storm, cyclonic in nature, which swept the entire country. Starting as far west as Wyoming, it rapidly worked its way eastward and struck with fiercest intensity in Nebraska, and on Easter Sunday in Ohio. In Nebraska it took the form of cyclones, which wrought great havoc in Omaha. In Ohio, as in nearly all parts of the country, it took

the form of rain. The figures furnished by the United States Weather Bureau in this respect are astounding. At Marion, O., the rainfall in the three days from March 4th to 7th was 10.6 inches, which is 3.9 inches greater than the total greatest rainfall for any month of March in the past twenty years, and more than one-seventh of the average rainfall per year at that point. The rainfall at the other sections of the flooded country was proportionately high.

With this evidence of a tremendous deluge more than state wide, it is not difficult to understand that streams and rivers should

overflow their banks, that reservoirs should be filled to the bursting point, and that levees should be deeply submerged and even totally destroyed. Exactly how high the various rivers rose, is at present unknown. It is said that at Dayton the Miami River rose from ten to twenty feet above its flood level, which is eighteen feet above its lowest record level. Its average normal level is about six feet above the low record. This Miami River, which is 163 miles long, and which has a drainage area of 5,247 square miles, seems to have wrought the most havoc. The latest estimate states that about 200 people were killed along it, of whom about 100 to 150 died at Dayton. The Scito River, 191 miles

long and with a drainage area of 6,432 square miles, caused the death of 100, and the Muskingum, 95 miles long, and with 7,797 square miles of drainage, of about 50 people. These latest reports make the death list about 1,000, which is greatly below the early newspaper assumptions.

In briefly reviewing the actual history of the flood, we find that as early as the morning of Monday, March 24th, the rivers were extremely high. By late Monday night all previous records were broken, and early Tuesday morning the Dayton levees broke.

Later on the same morning, the levees at Middletown and Hamilton went. By Tuesday noon every river city in Ohio, south of the divide, was flooded. The high waters of Monday washed away many railway culverts, and greatly delayed transportation. By Tuesday noon all through traffic across Ohio was obliged to be discontinued, with the exception of that of the Lake Shore and Michigan Southern Railroad. The destruction of telegraph and telephone communication was equally complete. Every flooded town was entirely cut off from the outside world for at least one or two days. The recession began Tuesday night and Wednesday, and from then on, communication was gradually restored. In Dayton and Hamilton the water supply was cut off, and it

was necessary to bring water from Springfield in tank cars. The gas supply was also cut off for fear of fires, and Dayton was in complete darkness for a night. Even this precaution did not prevent fires, as there were many in all the stricken cities.

Dayton was put under martial law, and to prevent looting a curfew was rung at six o'clock, after which people were not allowed on the streets until the next morning.

These, then, are brief facts about the most terrible and destructive flood in the history of Ohio, and one of the greatest calamities of modern times. It is, however, a comforting fact that the American public have nobly responded to appeals for help. All over the country subscriptions have been collected and performances given for the benefit of the flood sufferers, and, with such generous assistance, it is certain that distress can last but a short while.

# GET-RICH-QUICK INVESTMENTS

*H. L. Wadsworth.*

THE sum which the "Wild Cat" securities pilfer yearly from the pockets of the American people amounts to nearly one hundred million dollars. Postmaster Hitchcock estimates that this is the amount which the get-rich-quick swindlers take from the people. No doubt if the postals departments had not exercised extreme vigilance, the amount would have been doubled. Post office departments have been able to check to a certain extent the operation of notorious swindlers, but it is impossible to stop the use of the mail for the furthering of these fraudulent schemes.

Most of the swindling concerns possess a charter under the seal of some state, qualifying it to go out and rob as many as it can. In almost every state and territory it is perfectly simple to have incorporated the rankest kind of a proposition, except one, Kansas, which is making a serious endeavor to protect its citizens. Kansas has a law requiring every agent for stock to obtain from the State Bank Commissioner a permit to do business. Before granting this permit the Commissioner may make a complete examination of the project. The Commissioner has found it necessary to refuse hundreds of applications, and it is estimated that by so doing the public has been saved about two hundred thousand dollars. Other states are now preparing to take up this plan of protecting their citizens.

The get-rich-quick artist is an opportunist, changing his "trade" from time to time so as to be most benefited by it. When he goes into business he does not make up his mind to handle just oil. The choices which he has can be roughly divided into four classes, oil companies, mining concerns, real estate, and inventions. The swindler holds himself in readiness to take advantage of any of these that happen along. When the newspapers are full of stories about the acquisition of wealth by the discovery of oil in Texas, it is there that the get-rich-quick artist is plying his trade. Suites of offices are engaged in the large towns of

Texas and, over night, an oil company is formed that has just found an unlimitable supply of oil. Printers and lithographers are busy getting out literature which soon bulges the mail. No time can be lost, for only while the papers are printing glowing accounts of the money others are making can these swindling concerns get the seamstress's two hundred dollars and the widow's one thousand.

It might be interesting to know just how these concerns make up their mailing lists. The method is most ingenious and original. An unprincipled man buys one share of stock in several corporations. When he has had it transferred into his name he has a right to demand from the corporation a full list of the stockholders. These lists are sold to the promoters of the get-rich-quick schemes for a very high price. There is nothing illegal about this part of the trade. Section 53 of the Stock Corporation gives a right to demand to see the list of stockholders, and if the corporation refuses they must pay two hundred and fifty dollars for each day that they deny the permission. So anyone holding one share has a legal right to see the list of stockholders.

When it is all over, and there is nothing else to sell, the sumptuous offices are given up and the swindlers move to some other part of the country. Shortly afterwards the whole thing happens over again. This time someone—and someone is definite enough—has made a "strike" up in the wilderness of Canada and found a great amount of silver. The whole process is repeated, luxurious offices are rented, hurried orders are sent to the printers, and the mails are overburdened. The unsuspecting public again get out their savings and invest them in this new mining concern, with hope in their heart that they will soon be rich, but this time the result is, of course, the same.

It does not require much knowledge to be able to work one of these schemes. A little capital, a knowledge of how to play the game, a vivid imagination by which you are able to see—or rather, to be able to make other people see—prospects which never could exist, a stenographer who is capable of sending out lots of literature, and a neat-appearing office. Get your proposition, go to your office and start sending out the "stuff." The rest is easy. It is amazing to realize the number of people who are ready to believe what they are told.

Why is it that with all that has been written about and said about this game, the people still seem anxious to be caught. It seems to be a weakness of mankind to have the belief that many people get a lot for nothing and that he might as well be one of them. The credulity of the public in investment matters passes understanding. The proposition which is offered you, you figure, is different and it has all the earmarks of an honest enterprise. You know that dishonest schemes are being floated, but the one offered you could be nothing but honest. You invest and wait for the never coming returns.

Fortunes have been made by purchasing low-priced shares which soon afterwards have increased immensely in value. This is very true, but these shares have not been peddled about the country and sold to anyone whose name happened to be on the lists which the swindlers have prepared, It is not difficult for a man with a legitimate and sound proposition to get money. Capital is on the lookout at all times for profitable investments. The realization of this very elementary fact would do a lot towards putting an end to the get-rich-quick industry.

Magazines and newspapers that receive advertising from these fake investment concerns have a lot to answer for in the suffering and sorrow brought upon the trusting individual. It is generally the men and women, who are least able to stand the loss, who are defrauded. No vigilance, whether State or Federal, can protect them against the mail order investments. If upon receiving one of these prospectuses, people would consider its validity and say to themselves, "This proposition looks exceptionally good, in fact so good that there is no reason why they should want my few dollars." Under such circumstances the get-rich-quick industry would soon perish.

# MAKING UP A NEWSPAPER

F. W. SCHMIDT

I WONDER how many who daily scan a newspaper have any idea of the many things which go to make up this recorder of "history in the making." Look at to-day's paper, for instance. The contents can be classified under three heads. First: world events; second: local news; third: advertisements. For the sake of clearness let us take for an example an evening newspaper published in a city having a population of from 50,000 to 100,000 people.

As we are discussing the principal paper, it is taken for granted that the paper is served by the Associated Press. By means of a specially rented wire all the news of the world, as well as of the state, is obtained. The "Press" operator sits at his desk near a telegraph sounder and takes all the news down directly on a typewriter. This news from the Associated Press is gathered from all parts of the world by the association reporters under all kinds of conditions. Some may be in the principal cities of the United States or Europe, and others at places of danger, and at wars.

The local news is gathered by staff reporters who have definite "beats" to cover. Some take politics and all city affairs. others take suburban news, some "cover" deaths and funerals, Y. M. C. A., churches, and so on. For the foreign and domestic news, which comes over the wire after press time, the evening newspapers fall back on the morning papers and use clippings from these. The advertisements are attended to by the advertising manager in a separate department.

All the news gathered is typewritten and taken to the city editor's desk, where it is sorted and accepted or condemned. The news items that are accepted are given to the operators of the linotype machines. These machines, which have keyboards similar to typewriters, by means of molten lead forced into moulds, called matrixes, make type in strips the correct length to fit the columns. These strips are next taken to the forms and set up. Most

of the forms for the paper, such as the advertisements, household hints, jokes, etc., have already been set up since the paper went to press the day before and during the morning.

The printing room begins to be a busy place about 3 P. M. Then the latest news is being rushed in, linotyped, and set up in forms. As it is finished, one form after another is sent down stairs. When the forms close at 4 o'clock the last line is put in. The last form is taken to the elevator and follows its predecessor to the press room. There men take the table on which the form is placed and wheel it up to another table. One man hammers the form with a block to make sure that the type is flat. Then he puts a thick piece of damp paper-like substance, which is made of paper-mache, on the form; both seize heavy brushes and pound the paper down so that it is forced into the indentations of the type, making a mould of the type. This has to be done very evenly, as the type which prints the paper is cast from this as a mould. Then a substance, like flour, is sprinkled on and scraped off so that it fills only the holes, and another sheet of the paper is laid on. Two heavy pieces of cloth go next and then the whole form is slid under a press, which the two men, using a long bar, tighten as much as possible. The press is made so that live steam is led around the mould and it is thus baked for eight minutes. When taken out the paper is hard and has taken the form of the type. This is slid into a hollow, half-cylindrical vessel which has water-cooled faces, lead is poured in and as soon as it is cool enough to be handled it is taken out in the form of a curved plate. The edges are trimmed off, where there is to be no printing, and when cooled in water this type is clamped on the last roll, and the press, which has been oiled and tended to when the matrix was baking, is instantly set in motion. Before one can realize what has happened the newspaper is falling at his feet, nicely folded, just as he buys it on the street. Pick up the first one, and at the latest, at 4:15 you can read an item which you saw come in at 3:45, linotyped at 3:55 and set up at 4:00.

# THE AUTOMATIC TRAIN STOP

P. WINSLOW

DO you want $10,000? That is a small portion of the fortune which will, in all probability, come into the possession of someone before January 1st, 1915. The occasion is this: "The New York, New Haven and Hartford Railroad hereby offers a reward of $10,000 to be paid to the order of the Interstate Commerce Commissioners and Railroad Commissioners of Massachusetts and Public Utilities Commissioners of Connecticut to whoever shall first invent an automatic device that will safely arrest an express train locomotive that has passed danger signals, the test of efficiency to be its adoption within the years 1913 or 1914 by the New Haven Road, the New York Central, or the Pennsylvania, and approval or recommendation by the Interstate Commerce Commissioners." (Signed) C. S. Mellen.

The fortunate inventor, besides winning the $10,000 and receiving several fortunes from the sale of patents and from royalties, will, primarily or incidentally as we may choose to regard it, confer a great blessing on mankind by saving somewhere in the neighborhood of 776 lives a year. This is the average number of people killed per year in collisions and derailments in the United States for the three years ending June 30th, 1912.

That an automatic stop of some character is absolutely essential to modern American railroading is shown by the following appalling figures:

During the years 1907 to 1911, inclusive, there were 61,806 collisions and derailments. These accidents resulted in the death of 4,163 people, the injury of 63,002 more, and a loss of $50,025,303 worth of property. And 70 per cent of these accidents were due to carelessness. In 1912 alone there were 5,483 collisions and 8,215 derailments, which resulted in the loss of $13,865,000 worth of property, and 722 lives. The necessity for the automatic train stop is therefore obvious.

And yet, though no automatic stop has as yet reached perfection, many have been experimented with. Up to November 4,

1912, 341 patents have been issued for automatic train stops. These are being experimented with by most of the principal roads of the country. The New York Central is at present trying out four different stops, and has organized a committee to investigate the matter and to encourage inventors. The Pennsylvania Road is also experimenting with four; the Chicago and Eastern Illinois, with one; and the Chicago and Great Western with one. In all, fifteen different roads are trying out twenty different varieties of automatic stops.

Perhaps the most practical and nearest to perfection is the mechanical trip in use in the New York subways and Pennsylvania tunnels. The device is connected with the block system. A danger signal cuts off the current, releasing an armature, which opens a valve and lets compressed air into a cylinder which pushes up a trip. The trip comes into contact with a lever on the first car, applying the brakes. This has given great satisfaction in subways, but is not very practical above ground where the weather conditions, involving snow and ice, are variable. A great objection, moreover, is that if anything goes wrong with the apparatus, the mechanical trip fails to stop the train.

There is an automatic stop in use on the Washington, Oregon, Water Power Company's electric road, which also depends upon the block system. The block semaphore is connected with an arm lower down on the pole which, when set for danger, hangs over the train and breaks a glass tube on top of the car. This allows compressed air to escape and sets the brakes. A device very similar to this has recently been invented by a resident of Winsted, Connecticut, the difference lying in the use of the two uprights on the top of the car and a connection by wires in place of compressed air.

One of the oldest of the mechanical trips is the Rowell-Potter. It differs from others in the use of a spring to force up the trip, the unique part being the winding up of the spring by passing trains acting on a lever and a ratchet.

The Lacroix stop, under experiment on the Staten Island railroad, employs the closed circuit of the block system and another on the train, supplied by a dynamo in the engine. As long

as the circuit in the engine flows, it holds the brake valve closed and keeps a signal lamp burning. At the entrance of each block there is a third rail connected with the block system. A shoe from the engine comes into contact with this third rail, automatically breaking the local engine circuit. If there is a current in the third rail it restores the other circuit and the train proceeds. But if, being set for danger, there is no current in the third rail, the local circuit remains broken, the signal lamp goes out, the whistle blows, an armature on the brake valve is de-energized, and the brakes are set.

An indicator in the cab is a characteristic feature of the Gray-Thurber system. If the block system is at caution, a whistle blows. If the signal lamp says "Stop!" a bell rings. If the engineer fails to take action within twenty seconds the automatic stop comes into play, setting the brakes and stopping the train. A clock, attached to the indicator in the cab, makes a record whether the brakes are applied automatically or by the engineer.

The Carson-Burgess also employs signals within the engine. If the track is clear for two blocks, a white light burns. This becomes green if only one block is clear ahead, and red if the next block is occupied. At this last stage a bell rings, and finally the automatic stop is brought in.

One of the newest types is the Prentice Wireless Stop. A wire is imbedded between the rails, and from this the current jumps to a harp of wires hung under the engine. When the current is cut an armature drops, applying the brakes.

On this same principle is the Railophone, which is being experimented upon in England. Two coils of wire are used instead of a harp, and by means of induced currents from the imbedded wire, a telephone connection is set up. There is also an automatic brake attachment similar to that of the Prentice Stop.

Lest one should wonder that with all these automatic brakes there are any accidents at all, it is necessary to point out that none of the above-mentioned devices have reached a state of perfection. Mr. Mellen would not be offering to give away $10,000 if they had. It is needless to say that any practical automatic brake must reach a very high degree of efficiency. The New York Central's block system specifications call for signals

which will not fail oftener than once in 25,000 times. Any automatic stop worthy of adoption must be equally trustworthy. It is also true that a great many railroad accidents are from causes beyond the control of any automatic brake. The Block Signal and Train Control Board says: "Automatic train stops correct but one defect; namely, the failure of the engine man to observe, understand, and obey signal indications. They do not in any way insure that the indications displayed will be correct, nor in any way prevent collisions due to inherent defects in the dispatching system nor to improper working of the block system.

"When all is said that can be said in favor of the use of automatic safety devices, it still remains true that they correct none of the fundamental defects of the American railway practice. Bad methods of operation and management, inefficient supervision and inspection, poor discipline and lack of cooperation between different branches of the personnel, deficient structures, roadways, and equipment, all of which introduce fundamentally dangerous conditions, still exist and cannot be remedied by the use of automatic appliances."

Granting all this, as we undoubtedly must, there still remain those accidents caused by the "failure of the engine man to observe, understand, and obey signal indications." The Interstate Commerce Commission recently investigated 49 of the more serious of recent collisions. Forty-eight were caused by the errors of employees! Another striking instance is that of a road which discharged 30 engineers for running past danger signals; four were reinstated at the intercession of their Brotherhood. Within 18 months three of the four had killed themselves by again running past danger signals. The fourth was redischarged for the same offence.

It is to protect ourselves from such wanton carelessness, and to aid and increase the efficiency of more prudent engineers that we need the automatic train stop. The Interstate Commerce Commission advises it: "Railroads ought to unitedly experiment with the automatic train stop until a device of practicability for general use shall be evolved." The Block Signal and

Train Control Board recommends it: "The railroads should be urged to develop the art of automatic control."

Should it not be done with a reasonable degree of expedition. steps should be taken by the Government to stimulate such action. Common sense most certainly approves of it. Public opinion unanimously demands it!

PROFESSOR AND MRS. TAFT AND SECRETARY STOKES PASSING THROUGH UNIVERSITY AVENUE.

# SCIENCE NOTES

CONDUCTED BY E. CARLISLE HUNTER.

## A NEW USE FOR THE "MOVIES"

E. CARLISLE HUNTER

MOVING pictures have been used in about everything except in the manufacturing industries, and now they have crept into that field. It has been found that they can be used, not only to increase the profits of the concern, but to benefit the workman as well.

Briefly, the plan, as adopted by a New England concern manufacturing braiding and cable machines, consists of using a moving picture machine in conjunction with a time clock, to reduce the movements of the workmen to a minimum. It is scientific management employing advanced methods. A workman is photographed at his work and a time clock, working simultaneously, records the time consumed in performing the given piece of work. A careful study of the films shows where there is wasted effort that it may be minimized.

Previous to the installation of this moving picture machine, a workman used up 37½minutes in assembling one machine. After the films had been worked over, the time required was 8½ minutes for the same job. No miracle had been performed, but an interesting program had been followed out.

Previous to making the test, the parts of the machine had been brought to the assembler by a helper and placed on his bench. The workman, following the usual method, first put the base in position, then looked around for the first support. Having found it, he placed it in position and looked around for the second support, found that and placed it in position. He was busy, and everything seemed to be conveniently at hand.

Then the efficiency engineers began to study the films. These films are never projected on a screen, but are carefully scrutinized under a magnifying glass. The men study these films for days, noting every false motion and every delay caused by inconvenient arrangement of the parts to be assembled. The result of this test was the invention of a machine to aid in assembling, and the time was cut down to one-quarter the original.

In connection with the milling of bushings, a similar saving in time and effort was found possible. Previously, the workman was accustomed to reach behind him for the bushings, put them in the machine, and after they had been milled, turn around again and put them in a barrel. The pictures accentuated the fact that these turning and reaching operations consumed much time. After certain changes had been made, according to the advice of efficiency experts, the man's production went up 20 per cent at once, and his wages were increased $3.00 a week.

This new field for moving pictures in the realm of scientific management was thought out by one Frank Gilbreth, a man prominent in engineering circles. Motion study interested him for years, but it was not until recently, by the invention of a new clock, that he was able to carry out his ideas. This clock has a single hand which revolves every six seconds. This permits of divisions of one thousandths of a minute, and, as a matter of fact, the time is even read to half-thousandths. For example, when a workman reaches forth his hand to pick up a tool, the time of a movement is shown by the film, because the clock is always in the picture.

Although this process has been carried out by this company only in a limited way, the manager estimates that the increase in output will warrant a raise of one-third in wages.

* *

# THE WHITEHEAD TORPEDO

L. F. HARDER

THE Whitehead Torpedo was the idea of Captain Lupuis of the Austrian navy, who desired a means of propelling a small floating torpedo along the surface of the water. He was unable to do this, and sought aid in Mr. Whitehead, an efficient manufacturer of Fiume. Mr. Whitehead, seeing the possibilities of such a mechanism, set out to invent a self-propelled torpedo.

After two years of hard labor, he managed to produce the first Whitehead torpedo. This torpedo proved exceedingly erratic, and could not be made to keep its depth. At times it would run skimming along the surface of the water, and at others it would dive down and explore the bottom of the bay. However, Mr. Whitehead believed so strongly in his invention that he kept working until he had invented a balance chamber to keep the torpedo at a certain depth. This balance chamber was discovered in 1868, but was kept a profound secret until 1894.

The Austrian government was not financially able to secure exclusive purchase of the torpedo at the time, and accordingly Mr. Whitehead entered into negotiations with foreign powers. The English were the first to take especial interest in this torpedo, and requested that Mr. Whitehead bring two torpedoes to England with submerged tubes for the purpose of carrying on exhaustive trials. These trials proved very successful, and England purchased the secret, and the right to manufacture Whitehead torpedos for $75,000.

The torpedo has the shape of a cigar. It is from fourteen to seventeen feet in length, weighs about one-half ton, and has a range up to 1,000 yards with a speed of from thirty to forty knots an hour. The cost of these torpedos varies from $1,500 to $2,500, according to their size. They are very delicate pieces of machinery, and most careful attention has to be given to them.

All Whitehead torpedoes are divided into the following chambers:

1. The Explosive Chamber.
2. The Air Chamber.
3. The Balance Chamber.
4. The Engine Room.
5. The Buoyancy Chamber.
6. The Tail Section.

1. The Explosive Chamber contains layers of guncotton, and is in the nose of the torpedo. It is exploded by a striker on the nose. When the torpedo strikes an object, this pin is forced into a detonator, which explodes, and which in turn explodes the guncotton. There is a safety arrangement fitted to all strikers, however, which makes it impossible for the torpedo to go off until it has traveled fourteen yards through the water.

2. The Air Chamber, which is next in order, is the largest of all the chambers, and contains the compressed air which supplies the motive power to the engines. Although it has very thin cylindrical walls, the air is compressed in it as high as 1,350 pounds to the square inch.

3. The Balance Chamber is to keep the torpedo at a desired depth beneath the surface of the water. Its mechanism consists of a disc made water tight to the shell by an India rubber ring.

This disc has the pressure of the water acting on it externally, and that of a spring internally. It is so arranged that when a torpedo is above the desired depth in the water, the pressure of the spring expands the disc, which in turn moves a rudder at the rear, which directs the torpedo downwards. However, when the torpedo is below its desired depth, the pressure of the water on the outside of the disc is greater than the pressure of the spring on the inside; and accordingly, the disc contracts, causing the rudders in the rear to direct the nose upwards. The desired depth is obtained by changing the tension of this spring, so that in this way the torpedo can be made to travel at any depth.

4. The engine room is fitted with a three-cylinder compressed air engine. The shaft from the engine extends through the last compartment to the tail section, where it is fitted to the two propellers. The advantage of the three-cylinder engine is that it can never be on a dead center. The I. H. P. of some of the latest models of these engines is no less than 56.

# BOOK REVIEWS

CONDUCTED BY H. L. WADSWORTH.

*Descriptive Anatomy*. By Forest Ray Moulton, A.B., Ph.B., Professor of Astronomy, University of Chicago. Two hundred and fifty pages, with numerous drawings and photographs. The American School of Correspondence, Chicago.

The book is divided into a number of brief chapters, each of which deals with a definite portion of the subject. The most important sub-divisions are entitled: The Earth as an Astronomical Body, The Solar System, The Sun, The Constellations, Time, Comets, and Meteors. The closing chapter on Cosmogony contains a brief historical summary of the best known theories regarding the evolution of the solar system, together with the author's comments upon their validity.

In the chapter entitled Preliminary Considerations, the author points out the contributions made by astronomy to other sciences and to many departments of practical life, such as geodsy, navigation, and the determination of latitude, longitude, azimuth, and time. As the title implies, the work is entirely of a descriptive character and contains no mathematics.

The book seems well adapted to the needs of ambitious students who are carrying on their work by themselves without the stimulus of a teacher, and could be made still more serviceable to students of this class if each definite portion of the subject were followed by a list of well-chosen questions, in order to fix the fundamentals in the reader's mind. It is written in a clear style and the information is presented in a manner which inspires interest in the subject. The portions devoted to the sun, moon, comets, and nebulae are illustrated by unusually good reproductions of photographs, many of which were taken by the author at the Yerkes observatory. *C. S. Farnham.*

*Dana's Manual of Minerology*. By William E. Ford, Ph.D. John Wiley and Sons. 1912. 460 pp. Price $2.00. Dana's Manual of Minerology was first published by James Dwight Dana in 1848, and since then revised three times, the last being

in 1887. Any comment, therefore, on the main principles and value of a book so well known and widely used, a standard work for over half a century, would be worse than useless,—it would be impertinent. It is only, then, to the changes that have been made in bringing this book up to date that attention is called.

When one considers that the last review was made twenty-five years ago and that in this edition an attempt was made to give an adequate idea of Petrography in one chapter, the need of the present revision can be appreciated. While the original character and scope of the text has been substantially preserved, the book has been virtually re-written and a new set of text figures used.

The chapter on Petrography has been omitted and only a brief and general description of the various important rock-types given. This change has been rendered absolutely necessary by the tremendous development of the subject of Petrography since the last revision of the manual, a development so great that to give even an elementary knowledge of the subject a whole book is necessary.

The order adapted in the description of species has been changed to that of chemical classification, an arrangement that is now regarded as the most logical and useful arrangement.

In the back of the book are given various tables, among which one for the right identification of minerals is given, which is especially valuable.

The book is small and compact, yet comprehensive and clear, and will prove of great value to the mining engineer, geologist, and prospector, as well as to the student of elementary geology.

*Lucian Platt.*

The Yale Scientific Monthly wishes to acknowledge the receipt of the following books, which will be reviewed at the earliest opportunity:

A Laboratory Manual of Physics and Applied Electricity; by Edward L. Nichols; revised and rewritten by Ernest Beker. The Macmillan Company, $3.00 net.

Radioactive Substances and their Radiations. By E. Rutherford, D., S.C., Ph.D., L.L.D., F.R.S. J. P. Putnam's Sons, $4.00 net.

# ALUMNI NOTES

CONDUCTED BY P. R. ANNESS.

'06—A daughter, Kathleen Cora, has been born to Mr. and Mrs. Roswell C. Tripp of New York.

'09—Warren L. Ward is in the employ of the Russell, Birtshall & Ward Nut & Bolt Manufacturing Company of Portchester, N. Y.

'10—The engagement of Miss Helen May Jessup, daughter of Mr. and Mrs. Nelson R. Jessup of Stamford, to Alfred R Starr, Jr., son of Dr. and Mrs. A. R. Starr of New York, has been announced very recently.

'10—Gilbert Jerome has recently been elected Editor-in-Chief of the "Springfield Student," the college paper of the Springfield Y. M. C. A. College, at which he is in attendance.

JUNE, 1913



# The Yale Scientific Monthly

VOL. XIX No. 10

PUBLISHED BY MEMBERS OF
THE SENIOR CLASS OF THE
SHEFFIELD SCIENTIFIC SCHOOL
YALE UNIVERSITY

THE

# Yale Scientific Monthly

THE YALE SCIENTIFIC MONTHLY is published each month from September to June inclusive, by members of the Senior Class of the Sheffield Scientific School of Yale University.

Articles are requested from students of all departments, the Faculty, Alumni and all men interested in Yale.

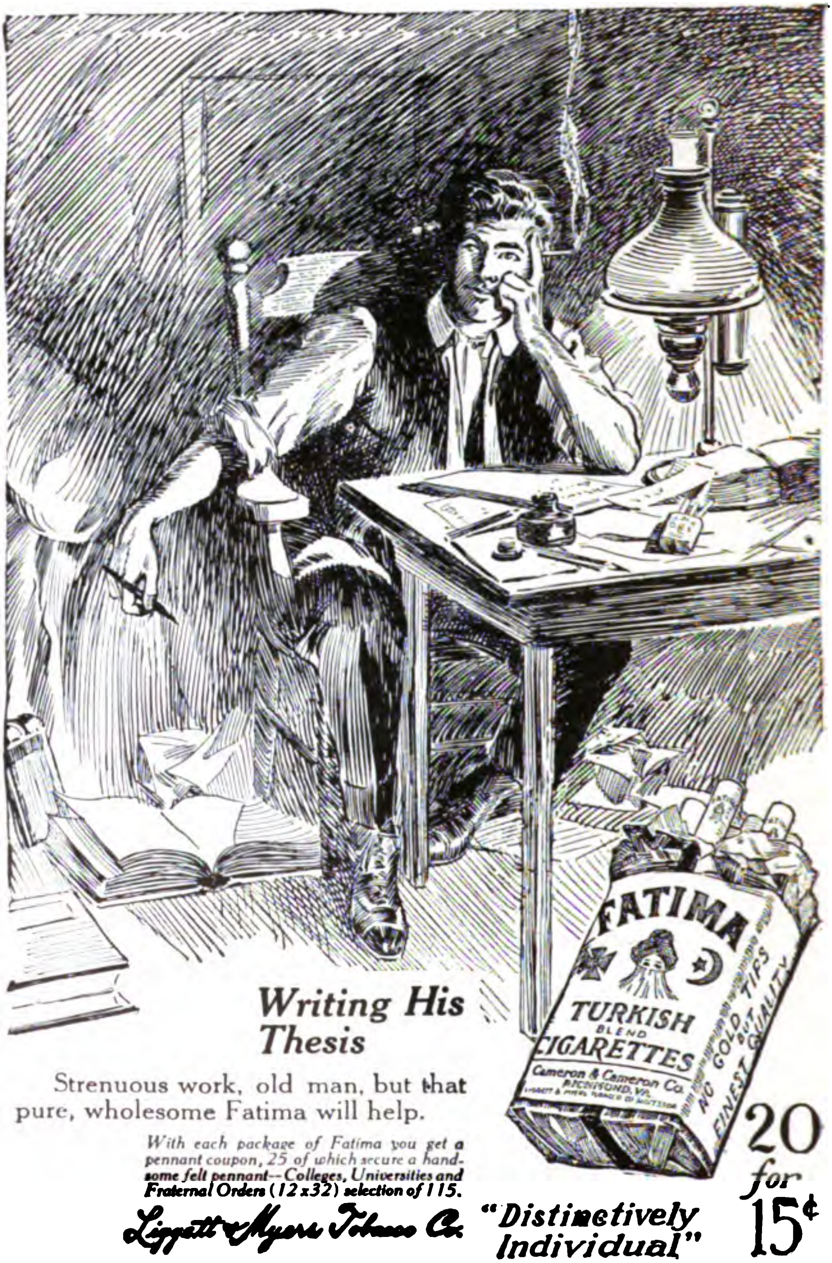
Subscription price to Undergraduates is $2.50 a year. Single copies, 25 cents.

All communications, except business letters, should be addressed to the Chairman of the YALE SCIENTIFIC MONTHLY.

The office hours of the Board are from 6:45 to 7:30 P. M. daily, except Saturday and Sunday. Office, first floor, Byers Memorial Hall.

## TABLE OF CONTENTS

VOL. XIX. JUNE, 1913. No. 10



Writing His Thesis
Strenuous work, old man, but that pure, wholesome Fatima will help.
With each package of Fatima you get a pennant coupon, 25 of which secure a handsome felt pennant--Colleges, Universities and Fraternal Orders (12 x 32) selection of 115.
Liggett & Myers Tobacco Co.
"Distinctively Individual"
20 for 15¢
FATIMA
TURKISH BLEND CIGARETTES
Cameron & Cameron Co.
RICHMOND, VA.
NO GOLD TIPS
FINEST QUALITY

THE

# Yale Scientific Monthly

FOUNDED BY THE CLASS OF 1895



VOL. XIX. JUNE, 1913. No. 10

# EDITOR'S NOTES.

## TO THE CLASS OF 1913 S

WITH the coming of June we are drawing near to that day, so long anticipated, when the members of our Senior Class shall enter their names in the ever lengthening file of alumni. It is with sincere and deep regret that we are compelled to wish these men farewell as they pass through that gateway which opens into the vague and uncertain realm of life in the world. Parting always brings its attendant sorrows, and each year the University is saddened by the graduation of its Senior Class. For three years these men have lived together and struggled together, forming one united body striving toward the same goal. Some will be able to look back upon these years with the satisfaction of having accomplished something—of having attained their ambitions. Others, perhaps, will review their years at college with the regret of having wasted so many opportunities which will never again be open to them. But one and all will remember these years spent here as among the pleasantest and most enjoyable of their lives. Whether or not a man has been far-sighted and industrious enough to avail himself of the

myriads of opportunities which crowd college life, he cannot but be benefited by the time he has spent here. He may have lost many invaluable opportunities, both in the classroom and in extra-curriculum activities, but he is sure to feel that he has been broadened and developed by his courses and by his association with other men. The friendships formed during these three years are bound to prove the most valuable of possessions.

In contemplating the graduation of these men, one cannot but wonder how far they, as a class, have succeeded during their three years of undergraduate life. The true measure of their success cannot be computed now—that we must leave to the future. However, in reviewing their record, one finds that, on the whole, the Class of 1913 have passed three very successful and congenial years in New Haven. They have worked together in a most admirable manner and have accomplished much in advancing the interests of Sheff in the University. They have done a great deal to aid in the work of placing Sheff on an equal footing with Academic. Their representation on the various teams and other activities has been very large. They have carried on the new Honor System in a highly successful manner, and have, by the recent changes, placed the Sheff Constitution on a sounder basis. In short, the Class of 1913 have carried on the work intrusted to it in a highly commendable manner.

We wish these men, who are so soon to emerge from our midst, the greatest success in whatever lines of endeavor they may choose. May they meet with the same success in the future that they have attained in their three short years of college life!

* *

## WELCOME TO THE ALUMNI

IT has been said that "no man ever graduates from Yale, there are so many reunions". This is indeed true, and it is a fact of which we have every right to be proud. A Yale man never does quite graduate from his University—he never wholly severs his connection from an institution to which he is so proud to belong. Its interests and his interests continue throughout his

lifetime to be joined and cemented by that mysterious tie we call "Yale spirit". This Yale spirit is not an abstract ideal; it is a concrete fact. It is not a mere transitory enthusiasm which springs up at the sight of a Yale team on the athletic field or at the prospect of a Yale victory; it is a sincere and deep affection, a real devotion, which every Yale man feels toward his Alma Mater. The Yale spirit outlives the temporary hysteria of the athletic field—it remains with a man to the end of his life.

In no way is the strength and sincerity of this spirit better shown than by the real enthusiasm with which our alumni gather together from all parts of the country at reunions. It is through their reunions that Yale keeps her graduate Yale men. At this time men of all professions—doctors, business-men, engineers, and all the rest—gather together here at Yale, drop the distinctions of their various callings, and become once more Yale men. It is at this time that we begin to realize the real strength of the Yale spirit.

It is with great pleasure that we are able to extend to these alumni, from the oldest graduate, staggering under burden of his accumulated years, to the youngest, who is back to his first reunion, our heartiest welcome.

* *

## OUR NEW ADVISORY MEMBER

IN addition to the undergraduate members of the Editorial Board of the YALE SCIENTIFIC MONTHLY, there is always an advisory member from the English Faculty of the School. For the past two years, Mr. J. R. Crawford has served in this capacity. We wish to express our sincere appreciation for his aid and advice, which have so greatly relieved our editorial perplexities.

Professor Henry N. MacCracken has very kindly consented to act as advisory member of the 1914 Board. On account of the many changes which we have made in the MONTHLY, there will probably be many times in the ensuing year when we shall feel the need of the advice of an able and experienced authority. We

feel sure that our new advisor will help us greatly at such times and trust that under his guidance we shall bring the SHEFFIELD MONTHLY to a higher position in the School.

* *

## THE KOPPER KETTLE KLUB

AT a recent meeting of the Kopper Kettle Klub the following amendment was made to the article on the membership of the club: "The Kopper Kettle Klub shall be composed of four men from each House in Sheff and four neutrals. Each society man shall elect a successor from his House and each neutral shall elect his successor from the non-society men of the Junior Class. The men thus elected shall be initiated into the club at its initiation banquet in the Spring."

By this amendment the membership of the club has been enlarged from 30 to 36 members. By reducing the number of men from each House from six to four, and by including all of the Houses, instead of merely five as heretofore, as well as a neutral representation, it is hoped that the club will be more representative and useful in promoting good fellowship among the Seniors in Sheff. Such an organization has a peculiar place in Sheff and the members of this year's club feel that this measure should do much to increase the value of the club by reason of having a more extended field from which to draw, and in which to work.

* *

## REVIEW OF THE STUDENT COUNCIL

THE Student Council of the Sheffield Scientific School, started on January 28, 1910, has won for itself the distinction of being the most representative body in the School and one of the most useful ones in the University. It has passed the stage of experimentation and has now come to stay. For three years it has taken up things which are of interest to the School and some of

the changes instituted by the former Councils are worthy of mention here.

1. Change of mark system so that a man may be excused from an examination if he has a mark of 3; provided that this system is agreeable to the Professor in charge.

2. Campus concerts and singing.

3. Procuring better seats for Sheff men at football games.

4. New methods in Sheff elections.

5. Abolishment of class officers, except Secretary of Senior Class.

6. Aided in drawing up and passing new Athletic Constitution.

7. Placing responsibility of the affairs of the three classes in the hands of the Student Council.

8. Arrangement for Freshmen smokers.

9. The Honor System.

10. Undergraduate Constitution.

The present Council has recommended or seen established the following:

1. Running of Sheff Rush by Student Council.

2. The Council, acting in coöperation with the Byers Hall Committee, has instituted smokers for Freshmen and Juniors, and three smokers for the Senior Class to take the place of those abolished by the societies and fraternities.

3. Formed, with the Academic Council, a University Council.

4. *The News* instituted, at the suggestion of the Council, a Bureau of Dates in its office.

5. Revision of the Undergraduate Constitution.

6. Revision of the Honor System pertaining to Undergraduate Discipline Committee.

7. Institution of a new Cut System.

The Council, in the past year, has done its best to be conservative after the radical changes of the previous year and only two changes were deemed necessary: (1) the thorough revision of the Undergraduate Constitution, based on the mistakes found during the year; and, (2) the revision of the articles pertaining to the Undergraduate Discipline Committee. The latter was felt by the Committee itself to be too unwieldy to

adequately take charge of its important work and a change was absolutely necessary.

There has been only one radical measure introduced, which at the time of writing has not been passed,—a new "Cut System." This has been the work of a whole year, the Council working in unison with the Faculty. It will, if passed, without doubt do away with many of the present difficulties. During the past year the Office has more and more turned Undergraduate affairs over to the Council and its routine work has become important in the extreme. From now on a Council need look for no outside work to do unless something is radically wrong, but the ordinary work, the running of the three classes, and the many smaller duties, will keep it busy, and make it a body ever increasing in usefulness. A. W. CHAUNCEY.

* *

## REVIEW OF THE Y. M. C. A.

THE work of the Association during the past year has been marked by unusual success along some lines of activity and the rise of problems along others. They have hindered the work of the Association and are of vital importance to it. Their solution is one of the most necessary acts which the men must do next year.

The first and oldest of these problems is the question of getting into the Y. M. C. A. men, who have not only the right consecration and a willingness to work, but also a considerable amount of time to devote to it. Most of the men best fitted for this are so engaged in outside affairs that they can not properly attend to the Y. M. C. A. This puts too great an amount of work on the remainder and on the General Secretary.

Corallary to this problem is the slump in the Association's activities at Prom time and during rushing season. Too much stress cannot be laid on this fact. The industrial work particularly is at a standstill during this period. It will be one of the first duties of next year's board to take precautions early in the year against its reoccurrence.

The Association is still handicapped by the regulations governing relations between the society and fraternity men and the members of the Freshman Class prior to mid-years. The rules prohibit all social intercourse between these groups. Hence, it is impossible to do much personal work among the latter when it would do the most good.

Turning now to the activities of the Y. M. C. A., the Industrial Classes first attract our attention. This branch of the work has grown wonderfully under the efficient leadership of the past year. Through it many working men are taught English, the rudiments of education, and personal hygiene. It is impossible to measure the good this work does among our less favored neighbors.

The Freshman Bible Class was conducted by Dean Brown. The men turned out in good numbers and the class was very successful. Professor Roe led a Bible class for the upper classmen. It met each week in a different society house or dormitory. In this way a new and responsive field was opened up. The attendance was large and the results very satisfactory.

Each year the Y. M. C. A. seems to be gaining a higher place and greater influence than it had before. The attitude of the students is more and more encouraging. We feel that the officers elected for next year will be capable of any task before them.

SUTHERLAND DOWS.

* *

## THE NEW STUDENT COUNCIL

THE SCIENTIFIC MONTHLY takes great pleasure in congratulating the new members of the Student Council upon their election. A great responsibility has been placed on these sixteen men, but we are confident that they are in every way worthy and that they will execute their various duties with that same tact and skill that has characterized previous Councils. Much has been done by this important body during the few years of its existence, but much still remains to be done.

The following constitute the new Council:

E. N. Allen, of Hartford, Conn.

F. F. Ainsworth, of Brookline, Mass.
C. L. Barker, of Los Angeles, Cal.
M. K. Blackmer, of Denver, Col. (Chairman).
J. T. Bryan, of New York City.
D. Bellows, of Brooklyn, N. Y.
M. G. Carter, of Memphis, Tenn.
H. W. Cowan, of Buffalo, N. Y. (Secretary).
C. J. Forve, of Los Angeles, Cal.
A. B. Hildebrecht, of Trenton, N. J.
M. W. Leech, of Pittsburgh, Pa.
J. S. Pendleton, of Minneapolis, Minn.
C. H. Plimpton, of Buffalo, N. Y.
H. Pierce, 2nd, of Frankfort, Me.
D. F. Tripp, of Chicago, Ill.
C. A. White, Jr., of New York City.

* *

## THE NEW UNDERGRADUATE DISCIPLINE COMMITTEE

IN accordance with the changes in the Honor System, which were announced in the May issue, the following five men have been elected by the Student Council to constitute the 1913-14 Undergraduate Discipline Committee:

George Boardman Blossom, of Chicago, Ill. (Secretary).
Charles Lawrance Barker, of Los Angeles, Cal.
Michael Gavin Carter, of Memphis, Tenn.
John Shepard Pendleton, of Minneapolis, Minn.
Nelson Strobridge Talbott, of Dayton, Ohio (Chairman).

The MONTHLY congratulates them and wishes them all success in their important duty of enforcing the Honor System.

* *

## THE AURELIAN SOCIETY ELECTIONS

THE Aurelian Honor Society has announced the election of the following members, honorary and active:

To Honorary Membership—Percy V. Jackson, '85S, of New York City; Edward D. Page, 75S, of Oakland, N. Y.

From the Class of 1913S—Nathan P. Bloom, of Louisville, Ky.; Clyde Martin, of Brooklyn, N. Y.; John F. Riddell, Jr., of Clinton, Mass.; Walter J. Seligman, of New York City.

From the Class of 1914S—Sevier Bonnie, of Louisville, Ky.; James T. Bryan, of New York City; Peter J. Falsey, of New Haven, Conn.; William A. Hunter, of Savannah, Ga.; Chester H. Plimpton, of Buffalo, N. Y.; Granville M. Smith, of Kansas City, Mo.; Nelson S. Talbott, of Dayton, O.

The officers for the ensuing year are: President, Nelson S. Talbott; Secretary, Granville M. Smith.

This society grew out of the feeling on the part of certain undergraduates and older advisors that there was need of some organization in the Sheffield Scientific School which should be a recognition of ability, achievement and promise as demonstrated by other tests than those of scholarship alone. To this end the Aurelian Honor Society was founded in 1910. It aims to recognize and encourage high moral character, gentlemanly conduct, ability in many lines, and at the same time good scholarship. It has as its deepest interest the welfare of the School and of the community.

Membership in the society is open to seven Juniors, who are chosen at the end of Junior year, and to a maximum of five and a minimum of three Seniors. From two to three Honorary members are also chosen each year from among the prominent graduates of the School or those who have been closely associated with it. The undergraduate members are elected according to the following seven classifications: scientific, literary, oratorical, executive, educational, religious and athletic, not more than two being selected under one classification, or more than two from one society or fraternity, until the final election in Senior year.

## ELECTIONEERING

WHEN Sheff was clamoring for a representation in the varsity managerships, one of the main objections raised by our academic brethren was that Sheff elections were notorious for their corrupt political methods. Electioneering was all too common, and skillful politicians often won more honors than the really worthy men of the class. Students who came here from the various large preparatory schools naturally clung together, and when elections were held, each school group put up their own representative, and, by canvassing among their classmates, brought bad political methods into the elections to a large degree. Obviously this state of affairs caused bad results, unrepresentative and incompetent men often holding the prominent offices. This not only seriously injured the efficient accomplishment of the duties of the office, but also gave Sheff a reputation for "rotten politics". The culmination of all this was the abolition of class offices, the Senior Secretaries excepted, which took place last year. At the same time there arose a general sentiment in favor of purer politics. Since then offices have not been so assiduously "heeled", and, until recently, electioneering had apparently passed out of existence.

Not until the non-fraternity and non-society Student Council elections was this supposedly buried "tradition" revived. Several of the Juniors were so attracted by the idea of being a member of the Student Council, that they openly solicited their own nomination and election. Although there is no written law laid down concerning this, it seems that it at least shows a lack of modesty on the part of a man willing to openly solicit votes. Moreover, this practice is injurious to the welfare of the School. Let us hope that this deplorable action will not be repeated and that the political morals of 1914S will not be further tarnished.

* *

## COMMUNICATIONS

The Scientific Monthly invites communications, but does not hold itself responsible for the sentiments expressed therein.

*To the Scientific Monthly:*

It is at this time of the year that the Seniors loom up and become an all important institution of the University. The realization that they must withstand the knocks and temptations which the world thrusts upon all people becomes an actuality. These men will no longer be able to sit and ponder what they would do if certain exigencies arose, but must meet every pressure. A Senior is somewhat similar to a president in the last days of office. He is a great and noble man who is about to become one of the masses—a common citizen. The minute a Senior receives his diploma and sheds his cap and gown, he becomes a humble struggler at the foot of the ladder, with everybody's feet in his face. Before Commencement he is a mass of aggressive pride so large that it takes the men of lower classes several minutes to comprehend him. He has completed his education in whatever branch he may have selected and is about to begin to work, worry, and earn a living. No doubt, there is a great pleasure in being a Senior, for he has had all that is coming to him in college and does not know what is in store for him in life.

Seniors ought to be well educated, and the majority have more knowledge than most men of fifty. A Senior is able to instruct a captain of industry in metaphysics and economics, or can repeat history faster than a bank president. Most Seniors carry this knowledge away and try to peddle it in wholesale districts or apply it to the position of shipping clerk. The graduate who is "making good" is the one who has taken off most of his "ologies" and stripped to his fighting clothes. Do not think I mean to say that Seniors are not necessary, because the world needs men with trained minds. However, a Senior should not expect to gain a livelihood by immediate and inadequate use of what he

has been taught; he must reserve his knowledge until it is called for and use other resources until that time.

*Ex*-1913*S*.

*To the Scientific Monthly:*

Even though New Haven water may not be the best for drinking purposes, it would be appreciated if placed conveniently in some of the recitation halls of Sheff. When one comes to think of it, there are very few places to obtain a drink of water without going some distance for it. Stands in Leet Oliver, North Sheff, and Winchester would be well patronized.

Water may be obtained in Sloane Laboratory, Mason Laboratory, and in the basement of Byers Hall. In the latter place it is only to be had at the lunch counter. This may seem an admirable location from the proprietor's point of view, for it is difficult to resist the temptation of buying something when one steps in for a drink; but to the thirsty student who rushes in between classes, this location does not appear convenient.

To conform with the orders of the doctor who invariably says, "Drink more water between meals," a Sheff man must necessarily do considerable walking around in the course of a busy morning. What few there are who care enough for a drink of water walk from the drawing room in North Sheff to Byers Hall or to the Chemistry Laboratory and drink from a beaker. Surely this ought not to be necessary. Let us hope that when we return next fall this much needed improvement will have been adopted.

1915*S*.

SHEFF SENIOR "Y" MEN.

## A REVIEW OF THE CLASS OF 1913 S

THE Senior Class of the Sheffield Scientific School is now drawing near to the close of its college career. It therefore seems appropriate at this time to present a brief review of the various activities of the members of the class. It should be interesting to all the undergraduates of Sheff, and especially to these men who are so soon to see the end of their student days, to be able to learn, from a few statistics, just what their class has done for the University and for Sheff during their short years as undergraduates.

In September of 1910, the Class of 1913S made its first appearance in the college world. In entering Sheff, they found themselves designated by the obnoxious term "Freshmen". However, they started off with a rush to vindicate their right to existence. In the fall of Freshman year thirteen of their number won their numerals on the Freshman football team. In fact, it seemed as if the whole team was to be comprised of Sheff men. They were W. P. Foss, Jr. (captain), D. L. Dunn, C. Gallauer, Jr., L. S. Wolfe, E. J. Davis, B. Gatins, O. H. Sheldon, E. F. Keirnan, K. McClintock, J. C. McGill, M. M. Munsill, J. D. Rogers, and F. S. Seeley.

In the spring of 1911, Sheff was represented on the Freshman track team by S. Cunningham, Jr., M. C. Dowling, W. P. Foss, Jr., T. K. Hendrick, K. M. McClintock, H. W. Merritt, H. N. Norris, A. B. Reeve, S. B. Seccombe, J. H. Stewart, E. A. Titcomb, and C. D. Walcott.

In baseball, also, the class had good representation on the Freshman team. E. W. Burdette, J. F. Riddell, Jr., A. W. Chauncey, W. W. Sherman, and J. W. Martindale, won their numerals in this sport.

In crew, the Class of 1913S fairly swamped—if this colloquial expression may be pardoned—the Academic Freshmen, seven out of the nine men on the eight being Sheff Freshmen. C. N. Snowden (captain), G. A. Gore, M. B. Ross, M. S. Denman, A. V. Bugbee, F. L. Stevenson, and C. G. Shepard (coxswain), were on the eight, and J. C. Hays and O. D. Covell (coxswain) on the four.

Altogether, the Class of 1913S made a remarkably good record in their Freshman year. Thirty-seven of their number won their numerals in the major sports—three of them in two different sports.

In Junior year, three of the Class of 1913S won the "Y" in football—C. Gallauer, O. H. Sheldon, and D. L. Dunn. Only two members of the class, E. L. Brown and J. F. Riddell, won their "Y" in baseball.

In crew, however, the class was better represented than in the other sports. G. A. Gore, M. S. Denman, A. V. Bugbee, F. L. Stevenson, and W. F. Howe won their "Y" in this sport in Junior year.

In Senior year the class was represented on the football team by C. Gallauer, O. H. Sheldon, D. L. Dunn, W. F. Howe, and S. A. Dyer. Burdett, Riddell, and Sherman are playing on the baseball team.

It is rather noticeable that only one member of the class, H. J. Norris, has won a "Y" in track.

In the minor sports, the class has been very well represented. Clyde Martin, G. A. Gore, and A. W. Chauncey played on the University hockey team. W. B. Hill, Jr., F. Snyder, and F. L. Chang have received the soccer insignia. The basketball letter has been awarded to D. L. Dunn, J. F. Riddell, and P. Deitz. D. M. Fuller, D. Summers, and W. F. Howe, Jr. were on the University swimming team. B. Goldenberg and J. A. Campbell have won the Gym. insignia. C. A. Bowles, Jr. and H. B. Lee have won their letters in golf.

Turning now from athletics, we come to the field of literary activity. Here we find that although the Class of 1913S has been as successful as any previous class, their representation is far behind that of Academic. It is to be regretted that we cannot hold our own in this department of endeavor as well as in athletics. R. A. Conroy, B. Harwood, and W. T. Ketchman were on the *News*. The editors of the SCIENTIFIC MONTHLY were F. D. Van Sicklen (Chairman), H. D. Schmidt (Business Manager), A. B. Reeve, Clyde Martin, and T. M. Prudden. The winners of the Senior charm competition of the MONTHLY were B. Bowman and W. Seymour. On the board of editors of the *Record* were A. B. Butler, Jr. (Chairman) and F. S. Meacham.

In musical and dramatic talent, the Class of 1913S has shown itself sadly lacking. It has had very little representation on the various musical clubs, and on the dramat.; J. H. Kelleher, W. P. Foss, Jr., and F. L. Stevenson, Jr., however, made the Glee Club, and W. B. Hill and M. R. Wibberly have been on the University Orchestra. On the Dramat. were R. A. Conroy and C. H. Strang.

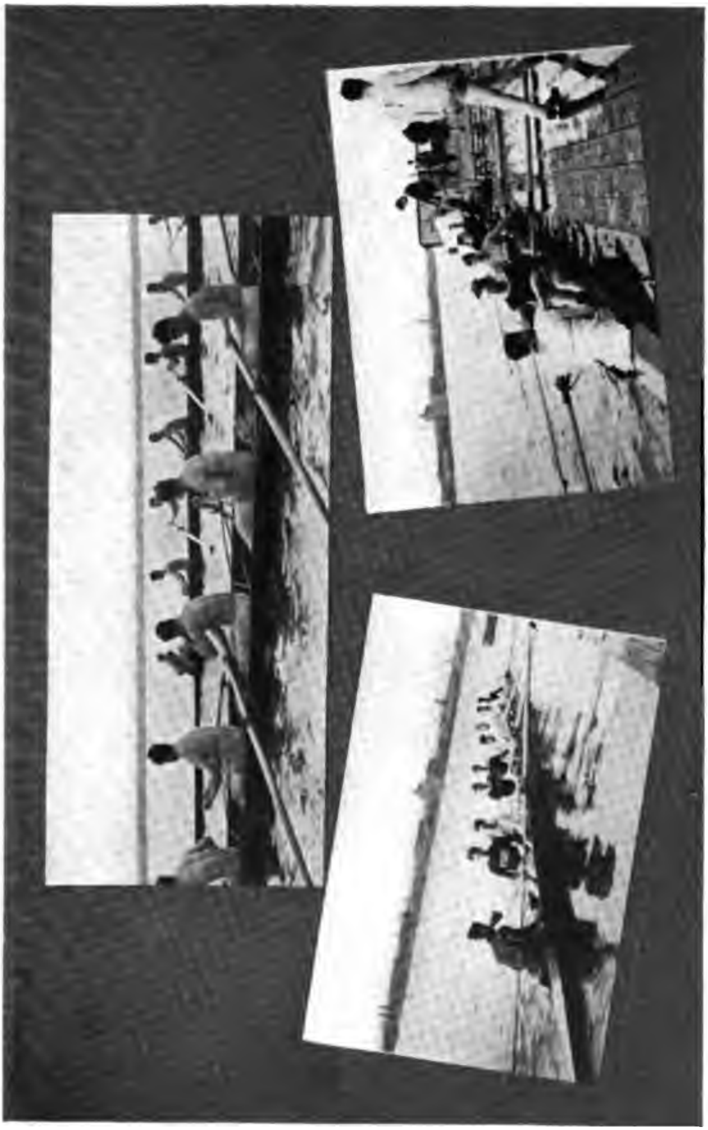
Turning now to the religious activities we find that the Class of 1913S was very active in this direction. The following have, during the past year, filled the various offices in Byers Hall: S. C. Dows, President; J. W. Watzek, Jr., Treasurer; Clyde Martin, Chairman of Boys' Clubs Committee; A. B. Reeve, Chairman of Bible Study Committee; S. Cunningham, Jr., Chairman of Class Deacons; E. H. Segur, Chairman of Wednesday Meeting Committee and Chairman of Yale Hope Mission Committee: A. S. Huntington, Chairman of Byers Hall Committee. The Senior Class Deacons are S. Cunningham, Jr., A. B. Reeve, and E. H. Segur.

Twelve members of the Class of 1913S were elected to Sigma Xi: G. V. Caesar, A. M. Chickering, F. B. Doolittle, S. E. Hadley, E. H. Hemingway, K. F. Lees, G. A. Parr, A. B. Reeve, W. C. Schmidt, P. W. Swain, and R. H. Willard.

In the Elizabethian Club are N. P. Bloom, A. W. Chauncey, S. C. Dows, R. Hunt, F. S. Meacham, H. N. Raymention, F. D. Van Sicklen, and F. White, Jr.

A. W. Chauncey, S. C. Dows, C. Gallauer, O. H. Sheldon, A. B. Reeve, C. N. Snowden, J. W. Watzek, N. P. Bloom, Clyde Martin, J. F. Ridell, Jr., and W. J. Seligman, are members of the Aurelian Honor Society.

This brief review shows that the Class of 1913S has been most successful in the major sports—especially in crew. In hockey also the class has held up its end in an excellent manner. It is to be regretted that an equally good record could not have been made in literary work and in the musical and dramatic lines. On the whole, however, the class are to be complimented on their record during their years as undergraduates.



FIRST AND SECOND FRESHMAN CREWS.

SECOND VARSITY CREW, VARSITY CREW,

# HISTORY OF THE YALE CREW RACES

*Jonathan Hunt.*

IT is a curious fact that most of the athletic sports which absorb our interest at present are very new in comparison to the age of the college. This is very true of crew racing, which made its appearance at Yale about the middle of the last century. The first rowing in America was done by various city boat clubs. As the sport increased in popularity in sporting circles it gradually extended its field to the colleges until it attained the important position which it holds today. Yale and Harvard were the first colleges to embrace this sport, several second-hand barges being purchased by the students of those universities during the years 1843 and 1844.

On May 24, 1843, William J. Weeks of the Class of 1844 purchased a four-oared Whitehall boat in New York City. This boat became the property of the first boat club that existed at any American college. The club consisted of Weeks and six other men, who banded together under the very appropriate name of *Pioneers*. Although this club lasted but a year, it blazed the trail for future rowing. About a month after the formation of the Pioneers, another club of seven men was started. Their boat was called the *Nautilus*, and was also a four-oared Whitehall. The third club of which we have record was started in that same year and was composed of fifteen Sophomores, whose boat was a large dug-out, forty-two feet long with a beam of twenty-four inches. The price of this craft, which was christened the *Centiped*, was but forty-five dollars. A very amusing incident took place in connection with a race which the *Centipeds* arranged with the *Nautilus*. The owners of the larger boat apparently doubted their ability to win and determined to use strategy, for on the night before the race, they sallied forth and fastened a huge stone to the keel of the *Nautilus*, with the natural result on the following day of a victory for the *Centiped*.

However, the first real racing boat at Yale was the six-oared *Excelsior*, which appeared in 1844. In all, during the first ten

years of rowing, there were fifteen boats owned at Yale, including six eight-oared, six four-oared, and three six-oared boats.

All this time, the crew enthusiasts at Harvard had been making similar progress. The Yale men conceived the idea of a race in which crews from both colleges should compete. Accordingly, a challenge was sent to Harvard, and accepted, and on August 3, 1852, the first Yale-Harvard race took place. It was not, however, between the Universities as such, but betwen various boat clubs of the colleges. Harvard was represented by the *Oneida*, while Yale had three boats, the *Halcyon*, the *Undine*, and the *Atalanta*. The race took place on Lake Winipiseogee, New Hampshire. After the arrival of the crews, they were so anxious for the race that they rowed a tryout in the morning, which the Cambridge club succeeded in winning. In the afternoon, when the real race took place, the Harvard crew again covered the two-mile course first and won the first price, which consisted of a pair of silver-mounted black walnut sculls. The *Halcyon* was second.

The rowing thus far had been entirely by classes or clubs, but in June, 1853, the navy was organized and a constitution was adopted, R. Waite, '53, being the first president. In 1855 another challenge was sent to Harvard and the race took place on the Connecticut River, near Springfield, on July 21. Both colleges were represented by two crews, Yale by the *Nereid* and *Nautilus*, both six-oared; Harvard by the *Iris*, eight-oared, and the *Y. Y.*, a four without a coxswain. The course was three miles long, a mile and a half down stream and back. Harvard had a much better stroke than Yale did, and both of her boats finished ahead of the Yale crews. There was a time allowance of 11 seconds for the smaller boats.

After this race there was no intercollegiate rowing for some years, although Yale crews rowed to some extent in professional regattas. However, in 1858, delegates from Harvard, Brown, Trinity, and Yale met at New Haven and formed the College Union Regatta. A regatta was arranged for that year, although at that time Yale and Harvard were the only colleges of the four that actually had crews. Unfortunately, the drowning of one of the Yale crew, George Dunham, a few days before the

race, necessitated its postponement. It is notable that this is the first year that a crew was picked from all the clubs to represent the whole University. The next year, however, the regatta was held, the *Harvard* finishing first, the *Yale* second, the *Arion* of Harvard third, and the *Atlanta* of Brown fourth. On the following day, which was July 27, Yale and Harvard entered the Worcester City Regatta, which Yale won, getting the first prize of one hundred dollars. This was the first time that a Yale crew defeated Harvard, although it was not strictly an intercollegiate race. The next year Sophomore and Freshmen races were added to the program, Harvard winning all three.

The outbreak of the Civil War drew many men from the colleges and the next race did not take place until 1864. In this Yale was successful, largely owing to the fact that Captain Bacon instituted hard training and a better stroke. In 1865, under the same captain, Yale was again victorious. The accounts of this crew mention the services of a regular trainer. Harvard then proceeded to develop a better stroke, and won for the next five years, the last year on a foul. Several other races took place during these years, Sheff beating the Lawrence Scientific School of Harvard in 1866 and 1869, and the Yale Freshmen losing to Brown Freshmen in 1870.

The year 1871 witnessed the founding of the Rowing Association of American Colleges. Yale did not want to enter this, but finally did, doing very poorly. At last in 1873, in the first year of Robert J. Cook's four captaincies, that man who was to become famous in Yale athletic annals and who was to develop the stroke which bears his name, went abroad and studied rowing at Oxford and Cambridge. He adopted the long sweep and slow recovery of the English school of rowing and reduced the Yale stroke to 32 and 34. The regatta that year was a big one, eleven colleges being represented. There was a dispute about who won, but the judges finally decided that the Yale crew had crossed the line first. The other crews in the race were from Wesleyan, Harvard, Columbia, Cornell, Amherst, Dartmouth, Massachusetts Agricultural College, Bowdoin, Trinity, and Williams. This year saw the establishment of the fact that only undergraduates were eligible to row. During the race in 1874, Harvard steered

into the Yale shell and cut away the rudder, thus preventing any chance of another victory. There had been a dispute as to "water" and the Harvard crew, judging from the result, must be awarded the decision. Columbia won the race. The next year the races were rowed at Saratoga, as they had been in 1874, and Yale could only capture sixth place in a field of thirteen.

After this rather disastrous outcome, Yale withdrew from the association and invited Columbia, Princeton, and Harvard to join in a new league. The number of crews in the association made the race unwieldy, as evidenced by the accident to the Yale shell in the 1874 races. Columbia and Princeton declined, but Yale and Harvard made an agreement to race annually in eight-oared shells with coxswains, instead of in six-oared boats as had been done in the association. The new Boat House was dedicated at Yale in this year.

In the next year, 1876, Yale won from Harvard on the Connecticut River, but again lost to Cornell at Saratoga. The crew was an excellent exponent of the Cook stroke and led Harvard at the finish by more than seven lengths. The Centennial Exposition was held at Philadelphia that year, and Yale entered a four in the races, having as competitors boats from Columbia and First Trinity College, Cambridge. The Cambridge captain, who had been very ill, collapsed during the race and the Yale crew beat Columbia by about two and one-half lengths. During the same Exposition, the Yale four entered the Amateur Champion Fours, defeating the Vesper and Crescent Rowing Clubs of Philadelphia, only to lose to the London Rowing Club in the semi-finals. This was the last of the four years that Robert J. Cook captained the Yale Crew. The next year, the Harvard-Yale race was rowed in very stormy weather on the Connecticut River, Harvard winning by two lengths. In 1878 the crews rowed at New London on the Thames River, where they still row. This year and the next Harvard again won, Yale rowing a poor stroke. After these three successive defeats a professional coach, "Mike" Davis, was engaged. He was at first successful, Harvard that year losing by eight lengths in a very slow race. The Yale crew was very heavy, as it was in 1881, when, after an exciting race in which first one and then the other crew was ahead, the endur-

ance of weight again won out. Davis, after some discussion among the rowing authorities, now obtained permission to build a boat after his own peculiar ideas. He said that it would beat all records for speed. It was 68 feet long and of narrow beam. Each pair of men sat in separate cockpits. From a distance the boat is said to have looked like four pair-oared shells in line. The men were taught a peculiar shuttle-like stroke. As it turned out the boat was very fast, although, in the race the coxswain steered it first on one side of the Harvard boat and then on the other, after being caught in weeds and other difficulties, so that Harvard won by about half of a length. The next year Davis remained in charge and built a boat similar to the year before, except that it was seventy feet long and had a big wind sail on the bow. The stroke was from 45 to 50. Harvard won by twenty lengths, effectually ending the Davis regime and the "Donkey Engine Stroke".

The next year saw Cook back in charge and a return to the Cook stroke and methods. Louis K. Hull, who had been captain in 1882 and 1883, coached under his direction. This coach proved successful, and Yale won by five lengths in 20 minutes, 31 seconds, the fastest time which had, up till then, ever been made on the course. Eighteen eighty-five looked as if it would be a good year for Yale, since there were seven veterans in the boat to Harvard's one, but the fickle goddess of luck turned her back and the Crimson crew was victorious. In the account of these races it has been thought best to chronicle merely the races of the Varsity Eights and not to include the Fours and Freshmen Crews unless something of particular importance happened. Something of that nature did happen the next year, for the Freshman boat sank during the race. Yale defeated both Pennsylvania and Harvard in this year. The next few years were bright ones for Yale rowing, the Blue finishing first in the next four races. Pennsylvania was also defeated twice in this period. In the last year of this series of triumphs, in a race between Yale and the Atalanta Champion crew, occurred one of the most dramatic events of athletic history. It is an event which has been written of in numerous juvenile books. Yale was leading at the two-mile mark by six lengths when Allen, the Yale stroke,

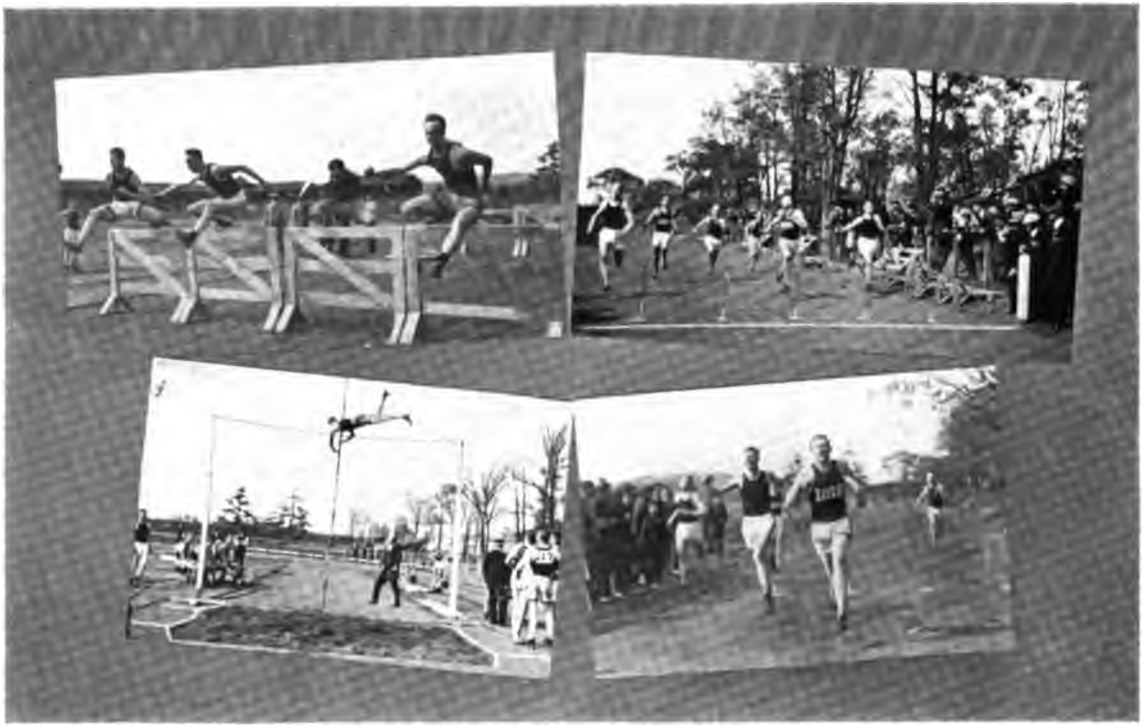
broke his oar. Instantly he dove over the side, and Ives, rowing seven, took up the stroke. The crew soon accustomed themselves to the change and won by eight lengths.

After five successive victories, Yale felt that she would like to race an English crew. Accordingly, a race was arranged with Oxford, with the condition that Harvard was first defeated. The unexpected happened, however, and Yale was defeated, which put a sudden end to preparations for the trip abroad. Yale, however, recovered herself, and for the next four years Harvard was quite easily beaten, the Yale Freshmen being equally victorious over their adversaries. The Columbia Freshmen took part in some of the Freshmen races. There was no race in 1896 owing to the fact that a football squabble severed athletic relations between the two Universities. Yale entered the Grand Challenge Race at Henley, Cook having agreed to coach the crew personally. After their arrival abroad, he did something, however, which in the light of subsequent events has seemed unwise. He attempted to change the stroke, which, with the men keeping too lax training rules, possibly hurt their chances. At any rate, they lost to Leander in the first heat. Leander was the ultimate victor of the Grand Challenge, however. While this was going on abroad, Wisconsin Freshmen came east and defeated the Yale Freshmen crew.

English ideas now reigned supreme in American rowing. Yale had been abroad, as had Cornell, and Harvard had as coach a famous English authority on the subject, R. C. Lehrmann. In 1897 Yale rowed at Poughkeepsie, losing to Cornell. Relations were patched up with Harvard now, and in 1898, Cornell, coming to New London, won again. Yale, although eight or ten lengths ahead of Harvard, was five behind the Ithacans.

The next year witnessed a return to the old system of dual races at New London between Harvard and Yale. Harvard no longer had the English coach and Yale had the services of a graduate, E. F. Gallaudet, who had stroked the crews of 1892 and 1893. Harvard won easily in this year. The next six years were all Yale victories. During this period John Kennedy began to coach. This glorious succession of victories was ended in 1906 by the success of the Harvard crew, but in the next year

Yale again demonstrated her superiority. In 1908 the collapse of the Yale stroke permitted Harvard to win easily, though the Yale crew finished with seven men, after a launch had taken the stroke away, thus finishing, as all Yale teams and crews do, no matter how far behind. Since then Harvard has won each year. In 1911 the Yale crew also suffered defeat at the hands of Cornell, Princeton, and Pennsylvania. In 1912, in the fall, a change took place, in that graduate coaching was established, with Mr. Rogers as coach. The New George Adee Boat House was opened May 6, 1911. The present year, 1913, the prospects are very encouraging. W. A. Harriman, '13, is Head Coach, and Mr. Rogers is also coaching. Two English crew experts, Mr. Gold and Mr. Kirby, were procured by the regular coaches who, with Capt. Snowden, made a trip abroad in the winter. Mr. Cook will again help out, and with such a fine staff of coaches, together with the excellent material that is on hand, there is every reason to expect that Yale will this year regain her old supremacy on the water.



SPRING MEET—FINAL HEAT OF HIGH HURDLES.

FINISH 100 YARD DASH IN YALE-PRINCETON FRESHMAN MEET.

CAPTAIN WAGONER VAULTING.

REVELL WINNING 220 IN YALE-PRINCETON FRESHMAN MEET.

# ACTIVITIES OF THE YALE ALUMNI CLUBS

*W. Seymour, Jr.*

A STUDENT upon graduating from Yale is very fortunate in having so many centers of Yale life scattered throughout the country in the form of Alumni Associations to which he can go. Very few, if any, universities are so well represented by graduate clubs. On looking over a list of the Yale clubs in the different cities, one is impressed with their number and widespread location.

Realizing that these organizations are, as a rule, carrying on a work of great importance to the University, and realizing further the ignorance of the undergraduates of this work, a few facts concerning several of these clubs and showing their activities will not be amiss. It would be impossible in an article of this scope to deal with all of the Yale graduate clubs, and therefore only a few of the larger ones are considered. We have tried to determine, among other things, what the various clubs are doing to induce men to come to Yale, and what, if any, scholarships they offer, since it is by these two things that a graduate club most directly benefits the University. The social life of the club, although an important item, means more to the graduates themselves than to the College. President Hadley, in his speech to the members of the Yale Club of Chicago, said that the great need of Yale was to keep in touch with all sections of the country, and it is evident that the Alumni Clubs are the best means of doing this. In discussing these organizations, we will consider each one and its activities separately.

Commencing with the Yale Club of Chicago, which is the second largest Yale Club in the country, we find that that institution is very active. This club was founded in 1866, and has since then been incorporated. Any person residing in the State of Illinois who has either been a student or a teacher at Yale, is eligible to membership, which is granted upon payment of one year's dues. The dues are not exorbitant, being limited to three dollars per year. During the last year the Club reached its

high water mark in membership, having 414 members out of 769 Yale men residing in and around Chicago. In connection with the Club is a body known as the Yale Scholarship Trust, which has as its object the helping of worthy, but financially embarrassed, men to come to Yale. During the past year the Scholarship Trust has had six men in New Haven, all of whom are doing very well. This coming year another man is to be sent, making seven in all that are being supported while in college by this Trust.

From this it is obvious that the Yale Club is doing a great deal to send desirable men to Yale, the value of a work of this kind being of course of great importance to the University. Another very promising department that has just been established by the Club, under the direction of the Secretary, is the Employment Bureau. This bureau aims to put Yale men in touch with a possible employer. A card index system is kept in the office of the Secretary, in which are listed the names of all applicants for positions and the names of employers, with a short description of the kinds of employment. In eight months forty-five applicants for positions have been filed and eleven of these men have been placed in permanent positions. Furthermore, the bureau coöperates with the Bureau of Self Aid in New Haven and the Committee on Business Information of the New York Yale Club, and has placed several men in Chicago who had registered first with the New York office. It would seem from this that the Chicago Yale Club is doing all that it can to help its members, as well as other Yale men.

The year's activities opened as usual with the annual meeting and election of officers, followed by a joint smoker with the Princton and Harvard clubs. The forty-sixth annual banquet, which was held at the Blackstone Hotel, had one very unique feature which was the big event of the evening. From his home in New Haven President Hadley delivered a speech which was heard distinctly by every man present at the banquet. This was done by means of the presence at each plate of a watch case telephone receiver, connected with President Hadley's home by long distance telephone. In addition to these banquets there are several other social functions provided at different intervals during the year, such as the dance given to the Musical Clubs during the Christmas holidays.

The Yale Club of Chicago has in its jurisdiction a larger percentage of Yale men who are members of the Alumni Club than any other graduate club in that city. The University is certainly very fortunate in having its interests in the West represented by such an active Alumni Association as the Chicago Yale Club.

Leaving this city, we will now give our attention to Cincinnati and its Alumni Club. It would seem from the information obtained that the Cincinnati Club is perhaps not quite as active or progressive as the Chicago Club. Nevertheless, it is a large club and one of importance. At present nothing is being done by this organization to induce men to come to Yale. Cincinnati has always been a strong Yale town which is well represented every year in the undergraduate body Many of the present Yale undergraduates from this city are the sons of former Yale men. This club does not at present offer a scholarship of any kind, although several years ago they sent one man to college. However, he failed to come up to expectations and since then the matter has been dropped. It is evident from these reports that there is practically no direct aid offered the University by the Cincinnati Yale Club.

On the other hand, we find the club in a flourishing state as far as membership is concerned, there being about 155 members. Every Yale graduate who resides in the city is considered a member of the club. Formal election to the club has been done away with for two or three years, and at present the only requirements for membership are one year's attendance at the University and the willingness to pay three dollars annual dues. Two meetings are held each year for the election of officers and the transaction of other business.

The Harvard Club of Cincinnati is a rather more closely organized body than the Yale Club, the members being elected. The Princeton Club is practically the same as the Yale Club. Neither of these two rival clubs are doing any great amount of work for the benefit of their universities.

As New Haven sends more men to Yale than any other city, her Alumni Association is certainly entitled to some consideration. Although nothing is being done directly by the Alumni

Association of New Haven to induce men to come to Yale, they are accomplishing a praiseworthy work by an indirect method. This graduate organization is constantly being strengthened both by a growing membership and by an increasing number of activities that serve to arouse a keen interest in the club in this section of the country. In addition to these, the members hold an annual dinner and smoker. As yet this body has been unable to offer any scholarships, but it hopes and intends to do so in the near future.

Although the club has only been established for the short period of three years, it already has a membership of over four hundred. The opportunity for a rapid growth is extremely excellent, there being 2,200 men who are eligible for membership living within the jurisdiction of the club. Any graduate, ex-graduate, or member of the faculty residing in New Haven County may become a member by paying the small fee of one dollar per year. The club has no rooms or specified quarters. In the words of the Secretary, the aim of the association is "to embrace all graduates, young and old, to have them donate a dollar a year, in appreciation of their education, towards helping some poor but worthy boys to receive that which will make better citizens of them by going to college." With this aim constantly set before such a large body of Yale graduates, it seems only fair to expect great things of them.

Next to the New Haven Alumni Association, the one at Hartford is the largest in the State. Hartford is a very strong Yale city and the University is represented there by an association of about 325 members, all of whom have been members of the University, although some are not graduates. Nothing is being done directly by the Hartford Association to induce men to come to Yale. Furthermore, they have never offered any regular scholarship which any student may try for, although if there is some worthy boy who, desiring to come to Yale, is hampered financially, he can get the association to lend him money. This is a great help, as some men who would otherwise be unable to go to college, are often thus enabled to do so.

It is hardly possible to call the social functions of the club very momentous, as they are limited to an annual dinner and an

annual meeting. All of the other college graduate clubs in Hartford are easily out-distanced by the Yale Cub, both in importance and in numbers. The Hartford Club, like the New Haven organization, has no club rooms or quarters.

Now we will be so bold as to invade the enemy's country, and examine the activities of the Yale Club of Boston. Of course, it cannot be expected that this Yale club could be larger than the Harvard graduate organization, since Boston is the stronghold of Harvard. In 1908 the old Boston Yale Club and the Yale Alumni Association of Boston united, and since that time the combination has been called the Yale Club of Boston. This club is trying to do all within its power to help the University. Every year cups are offered by the Yale Club to Andover, Exeter, Volkman, Worcester Academy, Hotchkiss, and Taft Schools, which are called the Yale Cups and which are awarded to the boy who is most proficient in scholarship and athletics. This seems to be a most excellent plan, as the cup represents the most versatile man. Although this club, like many of the Yale Clubs, does not offer any scholarship, it does aid the University by donations. This year the club gave five hundred dollars to the University Library for the purchase of books, and it is hoped by the club that this will be repeated.

Any man who has attended Yale for a year and resides in Vermont, New Hampshire, Rhode Island, Maine, or Massachusetts, is eligible for membership, and may become a member on the approval of the executive committee and the payment of the current dues. The dues are a little heavier than those charged by any of the other clubs considered so far, there being a fee of ten dollars per year charged each member. This sum covers all club expenses for the year. At present there are about 243 members of the Yale Club of Boston.

The club is also active socially. Besides the large annual dinner, meetings are held every month during the winter, after which there is an entertainment of some kind. It also has a field day and frequently attends in a body athletic events, in which Yale participates. The Boston Club is more fortunate in this respect than its western sister clubs, which are prevented from the enjoyment of attending many of these events because of their great distance.

Comparing the Yale Club of Boston with the Harvard and Princeton alumni organizations of that city, we find that Yale has a better organized and a more active association than Princeton, which holds meetings but once a year and, generally speaking, is not a strong aggregation. However, as would naturally be expected, the contrary is true in the case of Harvard. The Harvard Club is a very strong body and holds a great many social functions. Yale, like Princeton, lacks any special quarters, most of its dinners being held at the Boston City Club.

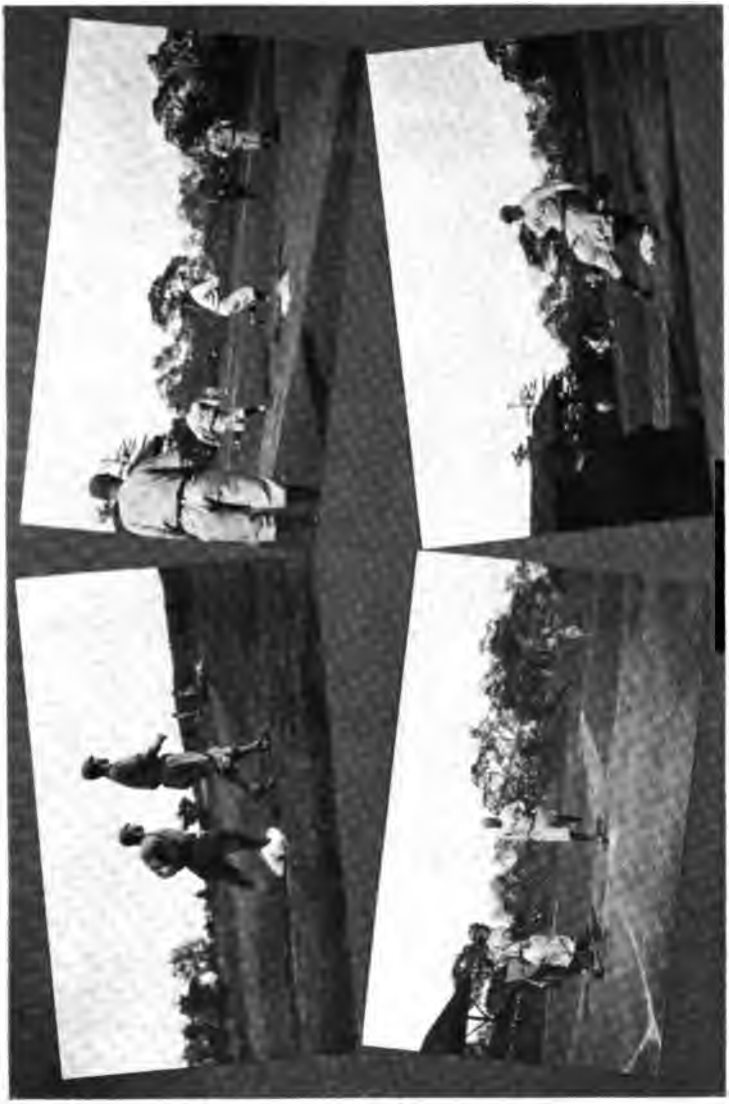
Let us now consider the largest and most important of all the Yale Alumni Associations. In 1897 the Yale Club of New York City was organized to succeed the Yale Alumni Association. When the club was incorporated its purposes were set forth as follows: "The particular objects for which the corporation is to be formed are to maintain a club house for the use and benefit of the alumni of Yale University, to promote the frequent meeting of Yale men, to secure mutual understanding and confidence between the University and its graduates, and, in general, to uphold the influence and further the interests of Yale University." The management of the club is entrusted to a council of twenty-one directors, divided into three classes of seven men each, each class to serve for three years.

Although no concerted effort is being made to induce men to come to the University, many of the individual members are doing all that they can along this line. At present there are about as many graduates who are active members of this club as there are students in college, the total membership being about 3,300. This number exceeds by far the membership of any of the other alumni associations. A person is eligible for membership who has received a degree from the University, or who, being of full age, has been a student or instructor in any department for at least two years. But no person is eligible who has not received a degree from the University, until the class with which he was last associated has been graduated.

The club is very active socially, it being customary to hold at least four entertainments during the year, with several additional musicals given on various Sunday afternoons. The club house itself contains a grill room, lounging room, billiard room, library,

main dining room, and several private dining rooms. There are about sixty bed rooms in the club house, some of which are held permanently, and some of which are reserved for transients. The bed room feature is especially emphasized in the New York Yale Club, more attention being given to this feature here than in either the Princeton or Harvard Graduate Clubs.

Surveying the work and activities of these Yale Clubs, it is at once obvious that they are doing a great deal for the University, as well as furnishing an excellent means for the graduates to keep in touch with one another. It would be difficult to overestimate the importance of these organizations to the University.



YALE-DARTMOUTH GAME.

BURDETTE ROUNDING THIRD. FALSEY OUT AT FIRST.

RIDELL SCORING. REILLY AT FIRST.

# THE GROWTH OF THE SHEFFIELD SCIENTIFIC SCHOOL

*P. Winslow.*

TO the average Sheffield undergraduate of today, the foundation of Sheff is a thing not only unknown but also, unfortunately, unthought of. And, indeed, this mighty institution, now so vital and important, had an origin so modest and unpretentious, that it is not to be wondered at that it has been nearly forgotten in the past sixty-six years. The Sheffield Scientific School, though not at first known by that name, was founded as the result of a proposal by Prof. Silliman, Sr., that a department be established for instruction in the physical sciences. Accordingly, there appeared in the catalogue of 1847 the announcement that "Professors Silliman and Norton have opened a laboratory on the college grounds for the purpose of practical instruction in the applications of science to the arts and agriculture."

The new department, known as the "Department of Philosophy and the Arts", was designed to cover all knowledge not already taught in the professional schools: Theology, Medicine, and the Law. Its faculty consisted of two men, Prof. John P. Norton, who occupied the chair of Agricultural Chemistry, and Prof. Benjamin Silliman, Jr., Professor of Practical Chemistry. Upon these two men fell the entire burden of running and of financially supporting the department. A conditional gift of $5,000 was soon revoked, as the condition of raising $20,000 was not fulfilled. Prof. Silliman resigned in 1849, and the department was left entirely to the resources of Prof. Norton. He was forced not only to take entire charge, but also to rent both a laboratory and apparatus. It is due entirely to the boundless energy of this man that the Sheffield Scientific School now exists.

This seemingly unimportant institution, consisting of two professors, eight students, and one building, having no examinations, giving no degree, and with students living where they would and studying when they would, had a surprisingly deep and lasting significance. It was originally meant for graduate work, and was the pioneer of graduate schools. It was also the first of the

scientific schools, though then, as now, the applications and principles of science were taught in a general rather than a scientific way. Here also originated the idea of elective courses, which fast became the prevailing system, and which was taken directly by Prof. Gilman to the University of California and to John Hopkins. Truly, Sheff has had its effect upon history!

Professor Norton died in the summer of 1852, after having persuaded the President to grant to every student who was graduated the degree of Ph.B. The members of the class of 1852, consisting of six men, were the first to receive this degree, then given for the first time in America. Professor Norton was succeeded by Professor John A. Porter, who had been at Brown University. That same year the Department of Civil Engineering was founded, and Prof. William A. Norton, also from Brown, was put in charge. This department was housed in the attic of the old chapel, and was quite distinct from the Department of Arts and Science. It may be here noted that the scientific part was all of this department that prospered, and in 1854 we find in the catalogue the name, "Yale Scientific School".

There are many names of note among the faculty of this period. George T. Brush, of the first graduating class, taught Metallurgy, and afterwards became the first Director of the School. The renowned James D. Dana lectured in Geology. Other famous names are Marsh, Whitney, Lounsbury, Verril, Brewer, and Daniel C. Gilman, who later became President of California and of John Hopkins Universities.

In 1854 the School received $5,000, the first of many gifts from Mr. Joseph Earle Sheffield. In 1860, that gentleman donated Sheffield Hall, and in it were united the departments of Chemistry and Civil Engineering. The next year, though with reluctance on Mr. Sheffield's part, the School received his name, and became the Sheffield Scientific School. The generosity of this man was really remarkable. Every year he gave to the School from $10,000 to $20,000, and his total gifts aggregated a half million. In addition he gave North Sheffield Hall in 1874, and on dying bequeathed to the School one-seventh of all his property, including his mansion on Hillhouse Avenue which, on the death of Mrs. Sheffield in 1889, was made into a Biological laboratory.

By an Act of Congress in 1862 the School became one of the Colleges of Agriculture and the Mechanic Arts. This entitled it to the income of a fund of $135,000. In spite of this Sheff was very poor, owing to its great increase in numbers. By 1872, when Prof. Brush became Director, the student body was 201, and by 1874, 249. There was then a slight decrease for a few years, due perhaps to the financial panic of 1873, which was followed by an increase till 1895. Another decrease then was caused by the change in entrance requirements, which resulted in most of the preparatory schools adding a year to their courses. Since then there has been a steady growth, and Sheff has now a student body of 1,242, not counting students from other departments.

In 1860 came the first regular entrance requirements, and a few years later the course was changed from two to three years. It was not until 1880, however, that formal entrance examinations were held.

As far back as 1870, the Board recognized the need of a course preparatory to the study of medicine, and about that time the course in Biology was started. But it did not have a building of its own until 1889, when the old Sheffield mansion was made into a Biological Laboratory. This course rapidly grew in size and importance; many students from Academic returning for a year to study this subject. To prepare them for this graduate work, they were allowed in Junior and Senior year to take certain undergraduate courses. This work was at first unrecognized, but later credit was given for it. Thus originated the system of allowing students from one department to take courses in another.

In 1890 Congress voted to increase the aid which it was giving to various colleges by the act of 1862. Unfortunately for Sheff, however, the Connecticut legislature decided that the conditions of the gift had not been lived up to, and the entire income went to the Storrs Agricultural College. Though the matter was taken to court, Sheff found no redress, and was again left in a condition of poverty. The total income lost was about $25,000. Meanwhile, the School had been outgrowing its equipment, and in 1890 the Governing Board started a new building without knowing where the money to pay for it was coming from. Quite voluntarily, Mrs. Oliver F. Winchester offered to pay for it, and the building now bears her husband's name.

Of the other buildings, the Chemistry Laboratory was built in 1894 and Kirtland Hall, given by Mrs. Lucy H. Boardman in memory of her uncle, Prof. J. P. Kirtland ,in 1902. In that same year, Byers Hall, so important in the religious and social life of Sheff, was presented by Mrs. Martha F. Byers, as a memorial to her husband and son, Alexander McBurney Byers, Jr., '94S. Another memorial hall is Leet Oliver, given in 1907 by Mrs. J. B. Oliver, in memory of her son, Daniel Leet Oliver. The more recently erected buildings are the Hammond Laboratory, given by John Hays Hammand, '76S., and the University buildings on the Pierson-Sage property. In one of these is the Sheffield Department of Physics, and in the other will be housed the Departments of Comparative Anatomy, of Zoölogy, and of Botany.

It would not be fitting to close without mentioning the system of dormitories which has come to mean so much to the undergraduate life. This movement was started in 1902 and was made possible largely through the generosity of Frederick K. Vanderbilt, '76S. Through his gifts the School has been able to purchase nearly the whole of Vanderbilt Square, and to turn many of the houses thereon into dormitories. Besides this they have erected two handsome dormitories, one on Wall Street, for Juniors, and one on College Street, for Seniors. These provide rooms for only 175 students, but it will surely not be long before more dormitories will be built, and the entire student body will be provided with suitable lodgings. When that time arrives, Sheff, with a campus and a campus life of its own, will truly be the equal, if not the superior, of the College.

OMEGA LAMBDA CHI CELEBRATION.

# A REGATTA ON LAKE WHITNEY

*D. S. Richards.*

THE year 1910 saw the end of the boating days of the Yale Navy on Lake Whitney, for in this year the New Haven Water Company passed a rule which drove the oarsmen to the harbor. The memory, however, of the regattas that were held there will always remain vividly fixed in the minds of old Yale men. They will often talk over the races, some of the closest ever fought, and then recall the walks out to see the varsity practice. They would watch the crew for a short while, and then slip over to some neighboring tavern or cider mill, or climb West Rock to look for Judge's Cave. These memories of the races will lead back to others—the fence and cane rushes, as they were then, the thoughtless pranks which caused the townspeople to gasp with astonishment, the fights with the "brass buttons", and many similar recollections.

The day of the regatta was one of those wonderful spring days that seem to put life into the very rocks. The crowds began to arrive. Every carriage or automobile in the town was pressed into service. The street cars were also crowded. It was indeed a beautiful sight to see the crowds gather and scatter along the shaded banks of the lake. Here and there small patches of color added to the beauty of the surroundings. Small patches of blue showed where the very loyal young ladies were. Here and there, a commotion in the crowd could be seen, due in all probability to a group of students pushing and pulling each other in a friendly rough-house. The crowds kept coming. Almost every nook and corner was crowded. The color scheme grew more beautiful with every fresh supply of visitors. Now, here and there, one saw bright spots of color harmonizing with the soft green of the meadows and hills.

There was a sudden movement in the crowd, and on looking across the lake we saw the crews putting their shells in the water. In a few minutes they were out, rowing towards the starting line. The crowds cheered and clapped. Everybody seemed to have

gone crazy. The noise was deafening. The crews worked slowly up to the line and stopped.

Everybody was quiet. Bang, we heard the starting gun echo back and forth across the lake against East Rock. The crews started together. Immediately one boat took the lead, only to lose it again when they had settled down into the long sweeping stroke that counts. They went down the course well bunched. There was one boat, however, that seemed to be lagging behind slightly. They kept close together all the way down the lake. They were nearing the finish mark, and the stroke had been raised. The boat that had been lagging behind, seemed to be gaining slowly. One of the other boats had broken badly and the men were splashing the water. They were very near the finish now. Two of the boats had pulled away and were fighting it out alone. The boat on the far side seemed to be gaining, but they were so far up the lake that one could not tell clearly. In a minute we heard the finish gun, and, quicker than any telegram, the news came down the bank that the Senior boat had won, with the Junior boat only half a length behind.

The crowds cheered themselves hoarse, not knowing why and caring less. They had seen a good race fought from the start to the very finish and they cheered just because they could not keep still. The bands struck up some old Yale song and everybody joined in. Suddenly the band stopped and everybody looked once more across the lake to the boat house, where more shells were being put into the water. The races continued in this way, all the afternoon, and they were all very close, being fought out to the end, for the class spirit was very intense. Finally the last race was over and the crews had gone into the boathouse.

The crowds started to leave. They wandered slowly along the lake front, as if they hated to leave the beautiful lake shore for the hot city. Students could be seen everywhere. Some were very happy and boisterous, others very quiet and solemn, for they had taken deeply to heart the victories or defeats of their classes. The street was filled with carriages and automobiles, the sidewalks were overcrowded, and the street cars were carrying more

than twice their usual number. Soon the last visitor had left, and Lake Whitney lay placid in the beautiful evening twilight.

The boating days of the Yale Navy on Lake Whitney are over, but the fighting spirit that was taught there will never die as long as Yale has a crew. Every year sees a Yale boat fight to the very finish, but recently only to be beaten, although this year we are sure that when the race is over we can leave the river at New London with joy in our hearts, with one more victory added to Yale's long line of triumphs.

SPRING FOOTBALL PRACTICE.

## CHANGES DURING THE YEAR

*C. W. Smith.*

DURING the past year or so, a number of changes have been made along different lines in Yale. Some of these are quite important, and some but secondary. Perhaps the first that should be mentioned is the addition of new buildings. In the Scientific School, heretofore, the courses of the different Engineering Departments and the Select course have been intermingled and the work has been carried on as best it could in a few buildings,—the several courses using the same buildings. This naturally proved unsatisfactory and crowded, and the possibility of isolating these courses was looked for and has been largely realized in the erection of four Departmental Laboratories.

Mason Laboratory was first used during the year 1911-12 by Junior and Senior Mechanical Engineers. This offered a large machine shop equipped with mechanical devices, engines, and an enormous crane, for practical work and tests by the students. There are also instructors' offices, and recitation and lecture rooms in this building, in which the technical work is carried on.

The Drawing courses are still given in Winchester Hall. The new Sloane Physics Laboratory on the Hillhouse property, is now partially in use by both Academic and Sheff men. This laboratory satisfies the need of an opportunity to have a course in Physics experiments and laboratory work. The coming year will introduce into some of the Engineering courses two years of Physics instead of one as heretofore.

Near this building there is the new Biological Laboratory. These two buildings are built along lines harmonious to the lately constructed buildings in Sheff—as Leet Oliver—though they are of brown sandstone instead of Indiana limestone. The Biological Laboratory will give more room for both graduate and undergraduate work and will concentrate it into one building taking it out of the top floor of Sheffield Hall and the old laboratory. The latter will soon be removed in favor of a wing of the

new Electrical Labratory that is now being erected between it and Leet Oliver Hall on Hillhouse Avenue. This is very close to Mason Laboratory in its English Gothic architecture and is made of the same Indiana limestone. This will afford a dynamo laboratory, a crane well, several smaller laboratories, class-rooms, lecture rooms, and offices.

Last fall the class of 1916 took up its residence on the Campus in Wright Memorial Hall, thus closing up historic York Street to further use by Freshmen. Though these new quarters are inadequate, a large number live in them, rooms being assigned by lot, the overflow living around at some of the old rooming places.

The new Athletic Field with its concrete "Bowl", seating 60,000 spectators, is old news. The necessary funds are fast approaching the required amount, and it is almost a certainty that the old wooden stands have seen their last Yale-Harvard football game. The purchase of the Hopkins Grammar School property and the adjoining lots by some few graduates may be news to a large number. Here it is proposed to erect a building which is to contain the office and equipment for all literary, dramatic, and musical work. This will centralize the extracurriculum work to a large extent. Besides having these offices, the building will give ample room for the rehearsals of the musical and dramatic organizations, and there will also be a hall in which to give productions and concerts.

There is now an Honor System in Sheff. This was introduced with the final examinations last June. It requires simply the word "pledge", on daily tests and papers and the full pledge, "I hereby pledge my word of honor that I have neither given nor received aid during this examination", on final or warning examinations. A Discipline Committee of five (formerly of nine) undergraduates enforces it and reserves the power of expelling a student and placing on probation or under official warning. The new system has worked very smoothly with the exception of only a few serious infringements.

Last fall the Sheff Freshmen were put under the Semester System, which is to take effect throughout both departments next year. This means that there will be only two terms in the year instead of three as heretofore. The scholastic year will

begin on the last Thursday in September, and continue nineteen weeks. The second term will begin on the day following the close of the first term and will also last nineteen weeks. Christmas vacation will begin on the first Wednesday after December fifteenth, closing seventeen days later. Commencement will be held on the third Monday in June, and the second term will close a week before that.

The Cut System in Sheff will be revised in the following manner: Freshmen will be allowed twelve unexcused absences, the thirteenth placing them on official warning. Juniors will be allowed thirteen cuts and the Seniors sixteen, in each case one more will mean official warning. A rather interesting method was followed in determining these figures. It was found, on investigation, that the average Freshman takes twelve cuts during this time, the average Junior thirteen, and the average Senior fourteen. A rated student is to be allowed the number of cuts allowed the class in which he is rated. A student on official warning or probation will be allowed four accumulative cuts, the fifth subjecting him to special discipline.

A year ago last winter saw the end of a successful movement to allow Sheff men to compete for managerships. This was long a sore topic of combat between Academic and Sheff, but was finally settled so that it was not too late to elect competitors for the spring sports last year. At a meeting of the Sheff Freshmen Class about the middle of October they elect a representative to compete against the representative of the Academic Sophomore Class for the football managership. Before Easter the class meets again to elect representatives for similar competitions for the crew and the track and baseball teams. Each department is to have two managers each scholastic year. The thing which the graduates follow most closely is the athletic record. Yale is badly in need of championships—particularly in football and crew.

After 1911 the crew was coached by graduates. The results did not come quite up to expectations. This year, along with the coaching by Yale men, the English stroke has been carefully studied and introduced, together with the use of the English shell. Since the crew went to Gale's Ferry, it has been coached by English

rowing experts and by an expert coxswain. After the disappointing results of the football season of 1912, Captain Ketcham, Walter Camp and three others served as a committee to decide on a future coaching system. It was decided that a man only three months out of college did not have sufficient experience to handle as important a position as Head Coach. In looking for an older man, Howard Jones, '85, was appointed to that position for next year, and much better results are hoped for.

MECHANICAL ENGINEERS' CREW.
CHEMISTS' BASE BALL SQUAD.
1914S CLASS TEAM (CHAMPIONS).

# SHINGLE HILL CLIMBS

*J. B. F. Bacon.*

THE name Shingle Hill may not mean much to the undergraduate of today, but to those who graduated a year or two ago the name means a great deal more. Shingle Hill was the place where the Yale Automobile Club used to hold its annual hill-climbing contests, which generally took place late in May or in the early part of June. So interesting were these contests that crowds came from far and near to watch the professional, as well as the student drivers, send their machines around the "S" curve.

The hill is located not far from West Haven. The starting point can be reached by a walk of a quarter of a mile from West Haven Green. From this point to the finish at the summit is not more than five thousand feet. Beginning at the bottom there is an abrupt grade, followed by a short level stretch, which served the motorists as a place to regain speed. The "S" curve follows with its rocky corners. Before the last two contests were held its sides were cut away, so as to make it less sharp. A steep climb leads from this point to the finish. The grade of the whole course varies from zero to twenty per cent.

Although they were well attended, these contests were held for only four years. No serious accidents occurred to warrant their discontinuance, so it seems plausible that their death was due mostly to automobile racing having reached the zenith of its popularity prior to the date of the last contest. Financial difficulties were experienced, yet not to any great extent, for, although the onlookers paid nothing, fees of five dollars or more were collected from each contestant. Expenses for guarding the course were very slight; students patroled the road, with the exception of one time, when Company E of the Light Guards had charge of the crowds.

The first hill climb was held in the spring of 1908 under the auspices of the Yale Automobile Club. George Townsend, '08, was the originator of the idea. The plan was to have both auto-

mobiles and motorcycles participate in such events as would test the merits of similarly built cars and similarly built motorcycles. A free-for-all event which was to take place after everything else was over, was considered advisable. The 1908 contest, being the first, was not so well attended as those which followed. The rules of the American Automobile Association were adopted and strictly observed. Everything went off smoothly and much enthusiasm was shown, so plans were made for a more extensive race the following year.

On May 26th, 1909, the second hill climb was held. Sixty-six cars were entered and twenty-two motorcycles, making this the largest hill climb contest ever held in this country up to that time, with the exception of the one held at Fort George. Two thousand people came to see the race, and the greater part of that number sought places near the "S" curve. There were three motorcycle events which came first and then followed seven automobile events. Out of the large number of contestants, only nine were college men, the others being professional drivers, local automobilists, and a few sent by various automobile factories. The gold medal which was given by the Yale Automobile Club to the fastest student driver was won that year by Richard E. Wiles, who drove a Stoddard-Dayton up the hill in one minute, nine and three-fifths seconds. Wiles was secretary of the club that year. David Bruce-Brown, Walter Webb, and Carl A. Broesel were among the professionals. Bruce-Brown, in a 120 H. P. Benz, came up the hill at the rate of sixty-five and a half miles an hour and made the record time, fifty-one and one-fifth seconds. Walter Webb, in a 120 H. P. Panhard, made the second best time. There were no accidents at all, and the success of the race was even greater than that of the former year.

The third hill climb took place June 7th, 1910. This year there was a slight drop in the number of entries, for the number of cars that were entered was forty-two, and the number of motorcycles was nineteen. Three motorcycle events took place at the beginning of the contest. H. H. Logan on a Merkel equaled the record made by Bruce-Brown in 1909. There were six automobile events, which proved fruitless from the stand-

point of breaking records. George Roberts, in a Simplex, completed the course in fifty-one and four-fifths seconds. Caleb Bragg, in a Fiat, made it in fifty-two and two-fifths seconds. Again the race was free from accidents, and its success called for another the next year.

The last and best attended contest was held June 19th, 1911. The spectators numbered twenty thousand. Many came from neighboring cities in their own cars, which were scattered along the sides of the course. The news that Bruce-Brown was going to try to break his record of 1909 induced many to come from afar. He entered the free-for-all event in a 200 H. P. Fiat, and, as if wishing not to disappoint the crowd, climbed the hill in forty-five and twenty-nine hundredths seconds, thus clipping several seconds off his own record. This was the greatest feature in the race, and, although it was highly interesting, it did not serve the purpose of promoting another contest.

Hill climbing contests at Yale ended with a grand flourish. A great deal of interest was shown each year in all the events. The professional drivers gradually came to occupy the center of attraction, and the students, for whom the contests were originally planned, were pushed into the background. Thus it came about that Yale was holding annual hill climbs which benefited, for the most part, only the outsiders. Shingle Hill had outlived its purpose from Yale's point of view.

# SCIENCE NOTES

CONDUCTED BY E. CARLISLE HUNTER.

## STEEL WHEELS FOR AUTOMOBILES

*W. Seymour, Jr.*

ANY careful observer cannot help but notice the ever increasing number of large trucks of the commercial type in our large cities. These trucks are called upon to carry tremendous loads at a good speed over the rough, cobblestone pavements, all of which are factors in the wear and tear on the wheels that have proved too great for wooden ones. This has caused a cry for more durable and substantial wheels for the heavy trucks, and has led to the introduction of steel in this connection.

The manufacturers of the different trucks disagree on the proper wheel construction. Wheels on the modern motor truck are called upon to carry a heavier burden at a greater rate of speed than ever before in the history of hauling, and in addition, these wheels are called upon to stand severe stresses, due to the transmission of power. These severe conditions have made it necessary for the manufacturers to increase the dimensions of the sections of the spokes and rims. Europe has also furnished us an example that is being largely followed out; namely, the use of cast steel wheels for the trucks. The metal of these wheels is of a very good grade, having a tensile strength of about 80,000 pounds and an elastic limit of over 40,000 pounds.

Many manufacturers, for reasons of their own ,which are generally prompted by their desire to refrain from any change in their manner of production, which incurs a large expense, advance so-called arguments against the use of steel wheels. Before taking into consideration the merits of steel, let us see of what in the main their arguments consist. They point to the

so-called fact that the steel wheel crystallizes, but this is a misapplication of terms. It is a well known fact among metallurgists that steel can crystallize only under heat, and once the metal is cold, the molecules are permanently set against any further change, thus prohibiting any crystalization. There is, of course ,a possibility that an improperly constructed wheel will have what is known as "metal fatigue", and this is often mistaken as crystalization. However, with a proper design, by avoiding any sharp angles or corners, merging the sections gradually and easily in long sweeping curves and arranging the masses of metals in proper relation to the thinner portions of the casting, no difficulty will be experienced.

As yet, cast steel wheels have not been in use long enough to determine by actual experience their length of life or to be able to make any accurate approximation as to their life. Already they have been used in Europe for several years, and judging by their performance, it is not unreasonable to suppose that a cast wheel will last as long as the truck itself, if not indefinitely. Probably the cast wheel will form the nucleus around which a new truck will be made as replacements are gradually necessary.

The steel wheel, in addition to its advantages of a long life, has other great points that appeal to the tire man, manufacturer, and to the truck owner. The owner finds that by using the steel wheel his tire cost and wheel maintenance charges are greatly reduced. The wheels are lighter, and always absolutely round. This reduces jolts and jars and tends to benefit the truck as a whole. It is found by the tire manufacturer that they give a firm, solid foundation for his tires, and being absolutely round, prevent destructive action on the tire. Furthermore, the steel wheel throws off the heat generated by the tires acting on the road surface.

As mentioned before, the manufacturer benefits from the use of these wheels. The machine work is greatly reduced, because the casting reaches the manufacturer of the trucks in one piece. This feature greatly simplifies the mill work, because all work in shaping the spokes, placing them in the felloes and in the hub is done away with. This permits the truck maker to do all boring that is necessary in one operation, except the holes for the

tire bolts. The flange can be faced down on one side and the hub up on the other, preparatory to receiving the bearing. It is obvious that this permits of absolute roundness and concentricity, the two most desirable features in a wheel. Furthermore, this is accomplished in one handling, and so creates a great saving in labor. The initial expense can be further lowered, if so desired, by casting integral with the wheel the sprocket wheel. Whi'e this may lower the initial cost, it is not always desirable, because the teeth are liable to wear out, which might necessitate a new wheel.

It is interesting to see the marvellous side strength in a steel wheel. They are able to withstand side thrusts of great intensity. Tests along this line were carried out on a ten-inch cast steel wheel with hollow spokes, and it was found that this wheel would withstand side thrusts as high as 270,000 pounds per square inch of spoke surface. William Johnson tested a certain wheel dropping it from a height to develop energy of 5,000,000,000 foot pounds. Even this severe test failed to fracture the wheel, although it was bent. But this could have been straightened out and the wheel used again. Of course, this was by far a greater side thrust than would ever be developed in actual service. This strength also serves wonderfully well for the transmission of power, for the disc radiating from the hub and forming the base and backing of the spokes, and the strengthening on either side of the uniform section spokes, strengthens these members at the very points where the stresses due to the driving strains are centered.

Another very great advantage of the steel wheel is the absolute concentricity of the hub flanges and sprocket which prevents the alternating tightening and loosening of the chain. In the case of the gear driven truck the advantage along this line is of a still greater moment.

Manufacturers have argued in the past about the advantages of the steel wheel from the view point of tire economy. It would seem at the present time that the advocates of the steel wheel have the best of the dissension. The heat caused by the friction of the tires on the road passes to the flange, which has a broad surface exposed constantly to the action of the air,

allowing the tire to give off its heat before any injury can take place. Up to the present time it has been impossible to compile any exact figures showing the gain, but the fact has been well maintained by practice. For example, truck tires on the wooden wheel are soon devulcanized by the action of the heat, but the same kind of a tire on a steel rim does not show any such action as this. Thus it is obvious that a metal rim has great advantages in tire saving.

Every conceivable test has been given to trucks equipped with steel wheels by the makers with the intention of finding out just how much they would stand. But as yet they have been unable to devise any practicable road test too severe for the wheels to withstand. It is, therefore, safe to assume that steel wheels are far more economical than wooden ones, and their adoption practicable.

# BOOK REVIEWS

CONDUCTED BY H. L. WADSWORTH.

THE YALE SCIENTIFIC MONTHLY wishes to acknowledge the receipt of the following books, which will be reviewed at the earliest opportunity:

*A First Course in Physics.* By Millikan and Gale. Ginn & Co. Price $1.25 net.

*Physical Laboratory Guide.* By Frederick C. Reeve. American Book Co. Price 60 cents.

*An Introduction to Zoölogy.* By Rosalie Lulham. MacMillan & Co. Price $1.60 net.

*Papers in Physics and Engineering.* By James Thomson. Cambridge University Press. Price 15 shillings net.

*The Modern Warship.* By Edward L. Attwood . G. P. Putnam. Price 40 cents net.

*Manual of Qualitative Analysis.* By W. F. Hoyt. MacMillan & Co. Price 30 cents.

*Radioactive Substances and Their Radiations.* By E. Rutherford. VII, 699 pp. $4.50. G. P. Putnam's Sons, New York.

If there is anything which deserves the designation "The New Physics", it is the interpretation of phenomena afforded by the electron theory and the insight which it has given into the relations of electricity and matter. The foremost contributers to these advances have undoubtedly been Sir John Joseph Thomson and the group of men trained by him at the Cavendish Laboratory. The interest shown by Yale in these developments is noteworthy. Professor Thomson was secured in 1903 as the first lecturer on the Silliman Foundations, and Professor Rutherford followed as the third lecturer in 1905. This was also the first University to establish a chair of Radio-Chemistry.

Books on science are too frequently but the compilation of the work of others. That is notably not the case in the volume

under consideration. The discovery of radioactivity by Becquerel, and powerfully radioactive substances by the Cunes, disclosed a wholly unknown field. The real pioneer into this region of tangled and perplexing phenomena was Rutherford. The separation of the alpha, beta, and gamma rays, the finding of the emanation and the excited activity, were all his discovery, and even the nomenclature is his. The disintegration theory first proposed by Rutherford, though received with marked incredulity by the chemists, has since found abundant confirmation and acceptance by the very numerous workers who have followed in his steps. Another notable contribution of this author was the suggestion that helium was a disintegration product of the radioactive elements, a prediction which was later confirmed by Ramsay and a number of other investigators. Rutherford's distinguished researches were crowned in 1908 by the award of the Nobel Prize. The work whose title stands at the head of these notes is not the first published volume by this author upon the subject. His book called *Radioactivity* appeared in 1904. His Silliman Lectures, already alluded to, were published in book form in 1906. The growth of our knowledge of the properties of radioactive substances has, however, been so rapid in the last seven years that the author in attempting to give a concise and accurate account of the whole subject, found it impracticable to revise the earlier books, and so has written an entirely new work. The first six or seven chapters are occupied with the phenomena of the radiations and methods of measurement. The next four chapters describe the disintegration theory and discuss the resulting products. The following five chapters are devoted to the lines of descent in the various families, such as uranium, thorium, and actinium. The succeeding chapter is assigned to helium and the emission of heat, and the last two take up such general topics as the chemistry of radioactive bodies, the constitution of the atom, and the distribution of radioactive matter in the earth and the atmosphere. Three appendices have been added which contain important tables of the radioactive elements and their constants, and a brief account of the remarkable method devised by C. T. R. Wilson for rendering visible the traits of the alpha and beta particles. The volume closes with a full and excellent

index which will be much appreciated. This book is another example of the beautiful typography of the Cambridge University Press and furnishes the reader with an authoritative and complete treatise on the subject of radioactivity, except in the field of its therapeutic applications, which obviously lies outside the range of physics.

*Frederick E. Beach.*

*Rocks and Their Origins.* By Grenville A. J. Cole, Professor of Geology in the Royal College of Science for Ireland. Published in the series of Cambridge Manuals of Science and Literature. 175 pp., 20 figs. Cambridge University Press and G. P. Putnam's Sons, New York. 1912. Price 40 cents.

This small handbook gives in a popular way many of the important facts about the character and origin of the more common rock types. The amount of space devoted to the description of the different classes of rocks seems hardly proportionate to their relative importance, one hundred pages being given to the subject of sedimentary rocks, while igneous and metamorphic rocks are given but forty and twenty pages respectively. While the different types of sedimentary rocks are described in some detail no attempt has been made to describe the important igneous rocks. Since igneous rocks have such a widespread occurrence and are so commonly used in structural work, it seems as if a book on rocks, even of a general and popular character should include some description of their more important types. The most interesting portions of the book deal with the effects which the characters of the rocks of the earth's surface have upon its scenery. These sections are well illustrated with a number of reproductions from photographs.

*W. E. Ford.*

*The Mathematical Theory of Heat Conduction.* By L. R. Ingersoll and O. J. Zobel. Pages 171. Published by Ginn & Co. 1912.

The authors have endeavored to develop the subject with special reference to the student whose mathematical preparation has not extended beyond the elements of differential and integral

calculus. Such a treatment of differential equations as is necessary for the further development of the subject is given in a few paragraphs at the beginning of the book. Throughout the book a great deal of attention is paid to practical applications of the theory developed. The insulation of ice-house walls, covered steam pipes, temperature waves in concrete, "shrunk" fittings, hardening of steel, electric welding, the theory of the fireproof wall, are but a few of the applications that will appeal to the engineer. Kelvin's problem of the cooling of the earth is adequately treated, and an estimate is made of the effect of radioactive substances on the rate of this cooling. A number of other problems of interest to the geologist are treated, such as the temperature of decomposing granite, and a whole chapter is devoted to the theory of the formation of ice. An interesting description, accompanied by an illustration, is given of the Michelson and Stratton Harmonic Analyzer. Several appendices contain tables of thermal constants, tables of integrals, etc.

*L. P.*

# ALUMNI NOTES

CONDUCTED BY P. R. ANNESS.

'96—On April 2nd, a son was born to Mr. and Mrs. E. M. T. Ryder of 23 Edgecliff Terrace, Park Hill, Yonkers, N. Y.

'02—Martin F. Menton was married to Mrs. Katherine E. Ryan in Jersey City on April 20.

'03—On April 20, a son was born to Mr. and Mrs. E. M. Smith of New York City.

'05—C. P. Winslow is Administrative Assistant in the Products Laboratory of the United States Forest Service in Madison, Wis. He may be addressed there or at the University Club of Madison.